Investigation of Risk Management and Uncertainty in Athens 2004 Olympic Games: The Equestrian Centre case study.

by

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ABSTRACT

The dissertation has as a main objective to investigate the Risk management and uncertainty during the construction phase of the Athens 2004 Olympic Games. A review of previous Olympic Games is undertaken, but also projects that were of significant value to the world and especially Europe like the Channel Tunnel, the Millennium Dome and the Wembley stadium. This 'comparison' intends to investigate how risk appears in everyday megaprojects and how it can be managed or even avoided. The study concentrated on the Olympic Equestrian centre, but studies and comments on some other Olympic projects in Greece as well through the analysis. Interviews were a powerful tool of the analysis as important outcomes and thoughts came out of them. The dissertation concludes with comparison on risks and uncertainty in Olympic projects and all those learned from the literature review, so that the reader can have an idea how really matters are dealt with in the real construction world. London 2012 Olympic Games is on their way, so hopefully this dissertation will be useful to what English companies should be aware of during constructing the venues.

Key Words: Risk Management, Uncertainty, Optimism Bias, Athens 2004 Olympic Games, Megaprojects.

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INTRODUCTION

The thesis aims to examine the managements of risks and uncertainty dealing with the Athens 2004 Olympic Games. It gives examples of other Olympic Games and projects, while it really focuses on the case study of the Olympic equestrian centre, which hosted the Olympic venue; the largest and probably most demanding project of all the constructed venues.

Structure of the thesis

Chapter 1 deals with the Olympic Games host city, how the games were won and a brief history of the Olympic Games from its revival on 1896. Chapter 2 is dealing with Megaprojects and how risk and uncertainty can be managed in those. Chapter 3 introduces megaprojects, such as Channel Tunnel, Millennium Dome and Wembley stadium as those are projects that can be compared with Olympic venues; their success or failure are interrelated with the risk they appear to have had and how well it was over-passed, if so. Chapter 4 focuses on the global phenomenon of Optimism Bias, it is analysed through examples and collected data and compares how optimistic were some biddings in particular projects and how they ended after construction. Then, continuing to Chapter 5 the reader can make his/her own opinion upon matters of risk management and effective ways of dealing with uncertainty in projects such as the Olympic Games and particularly the Equestrian centre. Chapter 6 introduces the case study of the Olympic Equestrian Centre while Chapter 7 analyses the interviews conducted, stating the most important points and conclusions the investigator came up with and compares literature review from previous chapters with the real situation in the case study. Finally Chapter 8 concludes on the whole dissertation with lessons learned from the Olympics, always around the area of uncertainty and managing risk.

CHAPTER 1: Information on Olympics and Equestrian centre

1.1 Introduction

On 5 September 1997, Athens was selected as the host city of the 2004 Olympic Games. The games took place in Greece from August 13th to 29th in 2004. The Summer Games returned home to the country that gave birth to the Olympic celebration more than 2,000 years ago and the city that staged the first modern Olympics in 1896. Athens was chosen as the host, after losing the bid to organize the 1996 Summer Olympics to Atlanta nearly seven years before.

1.2 Organisation

An elected city is entrusted with organising and hosting the Olympic Games, therefore ATHENS 2004 Organising Committee was set up to host the 2004 Olympic and Paralympic Games. The Organising Committee for the Olympic Games: ATHENS 2004 S.A. (trade name ATHENS 2004) was established in 1998. [1]

1.3 Finance

For the development of sports facilities and Olympics related projects the Games total budget was expected to be £3.4 billion. The Greek State would contribute £2.1 billion and the E.U. would contribute £0.5 billion; the rest would be funded by private investment. Unfortunately the total cost reached £6 billion, when Sydney Olympics only costed £2.2 billion. [2]

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[1] Members of the Athens 2004 Organising Committee (ATHOC) and observers monitored the Sydney Olympics closely, both during the preparation stage, as well as during the Games and recorded the entire organisational venture as part of the Transfer of Knowledge (TOK) Programme.

[2] Greek government budget suffered expenses of £4.8 billion; the rest £1.2 billion was paid from television rights and marketing sells. This was a number much higher than the initial estimate.

1.4 Construction and Olympic Village

There were three main construction categories: New Constructions; Upgrading of existing venues; and Temporary installations. The Markopoulo Olympic Equestrian centre was part of the new construction programme and was scheduled to begin works on September 2001 to April 2003. The Olympic Village was also part of new construction and it would accommodate 17,600 athletes. [3]

1.5 Environment

The ATHOC Environment Programme focuses on two sectors: a) the environmental dimension of Olympic planning and b) other environmental initiatives. The plan was not successful 100 per cent, but close to its target. Its failure, where occurred was a result of acceleration of works, so as the milestone was met, resulting in environmental damage at a greater stage than initial planning.

1.6 Insurance

The insurance costs for the 2004 Olympic Games in Athens were expected to be about £20 million to cover other problems such as terrorist assault or a cancellation. Following the September 11, 2001 attacks, concerns about terrorism were much higher. Greece increased the budget for security at the Olympics to £670 million. [4]

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[3] After the Games in 2004, the Village would provide homes to approximately 10,000 people in accordance with current housing programmes. British-based engineers, WS Atkins, are carrying out project management of the village complex.

[4] Approximately 70,000 officers patrolled Athens and the Olympic venues during the Olympics. NATO and the European Union also provided minor support after Athens asked for co-operation.

1.7 Problems and Success

By late March 2004, some Olympic projects were still behind schedule, and Greek authorities announced that a roof would no longer be constructed over the main swimming venue. The main Olympic Stadium, the designated facility for the opening and closing ceremonies, was completed only two months before the games opened, with the sliding over of a futuristic glass roof designed by Spanish architect Santiago Calatrava . Other facilities, such as the streetcar line linking the airport, the stadium and the city, were largely unfinished just two months before the games. The subsequent pace of preparation, however, made the rush to finish the Athens venues one of the tightest in Olympics history. The Greeks, unperturbed, maintained that they would make it all along. By August 2004, the Olympic Stadium was officially completed and opened, and the Athens Tram and Light Rail became operational.

Despite all those problems Athens hosted one of the most successful and spectacular Olympic Games of all times and raised the standards for later candidate countries; all of this at an economical compensation of course, but with enormous heritage for the years to follow as the Prime Minister stated.

Figure 1: The Olympic flame at the opening ceremony

CHAPTER 2: Megaprojects and Risks

2.1 Introduction (The Megaproject Paradox)

Olympic Games projects can only be compared as whole with multibillion-dollar mega infrastructure projects, such as the Channel Tunnel, the Millennium Dome, the Wembley stadium, but also others such as the Vasco de Gama bridge in Portugal or the Oresund bridge between Denmark and Sweden, always talking about Europe. [5]

Megaprojects form part of a remarkably coherent story. Sociologist Zygmunt Bauman perceptively calls it the 'Great War of Independence from Space' and he sees the resulting new mobility as the most powerful and most coveted stratifying factor in contemporary society. Paul Virilio speaks of the 'end of geography' while others talk of the 'death of distance'. Bill Gates, founder and chair of Microsoft Corporation, has dubbed the phenomenon 'frictionless capitalism' and sees it as a novel dubbed the phenomenon 'frictionless capitalism'. (*Time, 1998*)

Infrastructure has rapidly moved from being a simple precondition for production and consumption to being at the very core of these activities, with just-in-time and instant Internet access being two spectacular examples of this. Infrastructure is the great space shrinker, and power, wealth and status increasingly belong to those who know how to shrink space, or know how to benefit from space being shrunk.

There is a paradox here, however. At the same time as many more and much larger infrastructure projects are being proposed and built around the world, it is becoming clear that many such projects have shrikingly poor performance records in terms of economy, environment and public support. Cost overruns and lower-than-predicted revenues frequently place project viability at risk and redefine projects that were initially promoted as effective

[5] The European Union, with its grand scheme for creating so-called 'Trans-European Networks', is an ardent supporter and even initiator of such projects, just as it is the driving force in creating the regulatory and de-regulatory, regimes that are meant to make the project viable.

vehicles to economic growth as possible obstacles to such growth. The megaproject paradox consists in the irony that more and more megaprojects are built despite the poor performance record of many projects. (Flyvbjerg, et al., 2003)

2.2 Facts for Megaprojects

The cost-benefit analysis, financial analysis, environmental and social impact statements that are routinely carried out as part of megaproject preparation are called into question, critisised and denounced more often and more dramatically than analysis in any other professional field we know.

In terms of risk, most appraisals of megaprojects assume, or pretend to assume, that infrastructure policies where things happen only with a certain probability and rarely turn out as originally intended. In the words of Silvio Funtowicz and Jerome Ravetz, where facts are uncertain, decision-stakes high and values in dispute, risk assessment must be at the heart of decision making.[6]

2.3 A calamitous history of cost overrun

Given the large amounts of money spent on major transport infrastructure projects, it is remarkable how little data and research are available that would help answer the two basic questions: (i) whether such projects have the intended effects; and (ii) how the actual viability of such projects compares to projected viability.

A first step in reducing cost overrun is to acknowledge that a substantial risk of overrun exists and cannot be completely eliminated; but can be

[6] Megaprojects are so complicated that by nature are essentially hybrid. This is the case even for projects that are considered fully private, for instance the Channel Tunnel, because the sheer complexity and potential impacts of megaproject dictate deep public-sector involvement for many issues, for instance regarding safety and environment. Thus public-private collaboration is crucial, even for private-sector projects. A high trust democracy is the only way to face a risky future. (Funtowicz et al., 2001)

moderated. The next step is to allocate the risk of overrun to those best able to manage it.

A main cause of overruns is a lack of realism in initial cost estimates (Optimism bias). There is a tendency towards a significant underestimation of costs during project appraisal. The length and cost of delays are underestimated, contingencies are set too low, changes in project specifications and designs are not sufficiently taken into account, geological risk is underestimated or ignored, and quantity and price changes are undervalued as are expropriation costs and safety and environmental demands. Many major projects also contain a large element of technological innovation with high risk. Such risk tends to translate into cost increases, which often are not adequately accounted for an initial cost estimates.

A research conducted by the Aalborg University showed that – in nine out of ten projects transport infrastructure projects costs are underestimated, resulting in cost overrun, - cost underestimation and overrun exist among 20 nations and 5 continents; it appears to be a global phenomenon. [7]

Among the most spectacular examples of cost overrun are the Sydney Opera House with actual cost approximately 15 times higher than those projected and the Concorde supersonic airplane with twelve times higher costs.

The conclusion is that institutional checks and balances, including financial, professional or even criminal penalties for consistent or foreseeable estimation errors – should be developed to ensure the production of less deceptive cost estimates.

2.4 Substance and spin in megaproject economics

The key variables of financial viability for any major project are costs (investment, financing, operations and maintenance) and revenues. For each

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[7] Cost overrun today is in the same order of magnitude as it was ten, thirty or seventy years ago. Strong incentives and weak disincentives for cost underestimation and thus for cost overrun may have taught project promoters what there is to learn, namely that cost underestimation and overrun pay off. If this is the case, cost overrun must be expected and it must be expected to be intentional.

variable, forecast values may be different from actual values. A risk therefore exists that actual project viability may be substantially different from forecast viability.

The difference between forecast and actual viability may be so large that if the actual viability had been known for a given project, decision makers might have resolved:

(i) not to implement the project

(ii) to implement the project in another form

(iii) implement another project

In other words, non-viable projects, or projects than are less viable than forgone projects, may be implemented not because they are viable but because their viability was inaccurately predicted. The result would clearly be an inefficient use of resources.

The World Bank has called for not only more accuracy in estimates of viability, but also more honesty.

The main lessons to be learned from projects are:

(i) Cost overruns of 50% to 100% are not uncommon in large projects, especially transport ones. Similar figures hold for other projects as well.

(ii) Demand forecasts that are wrong by 20-70% are also common for large infrastructure projects.

(iii) Forecasts of viability for large transport infrastructure projects are often over-optimistic to a degree where such forecasts correspond poorly with actual development.

(i) The difference between forecast and actual costs, revenues and liability, which have been documented in this and the previous two chapters, cannot be explained primarily by the innate difficulty of predicting the future. The key problem is the lack of accountability for the parties involved in project development and implementation and not the lack of technical skills or poor data.

Of course this state of affairs does not mean that viable projects and projects showing 'good practice' regarding estimated and actual viability do not exist. But there are many more projects with underestimated costs and

overestimated benefits than there are projects with correctly estimated costs and benefits, not to speak of projects with overestimated costs and underestimated benefits, which are even rarer. (Measured as economic rates of return; World Bank, ECON Report, 1998)

Some people argue that in order for the project to flow and run a state of some delusion has to be addressed, which in my opinion is not the case; problems caused by initial delusion during a project can be much bigger later with other consequences.

2.5 Dealing with Risk

It is fairly common in feasibility studies and appraisals of major projects to make mechanical sensitivity analysis examining the effect on project viability of hypothetical changes in, for instance, construction costs, interest rates and revenues. The typical range for such sensitivity is ±10% to ±20%. It is unfortunately rare, on the other hand, that risk analysis is made by identifying alternative future states of costs, revenues and effects and a probability distribution estimated for the likelihood that these states would actually occur. But this particular information is important. [8] Risk analysis is also the basic for risk management, which is the identification of strategies to reduce risks, including how to allocate them to the parties involved and which risks to transfer to professional risk management institutions, namely insurance companies.

The conclusion is that risks involved in megaprojects are high and are typically treated in a deficient, sometimes even deceptive, manner in feasibility studies and project appraisals, if treated at all. (Flyvbjerg, et al., 2003)

Some good examples are: the technologically high-risk Apollo aerospace programme is considered a classic success story of megaproject planning and implementation. The cost overrun on this US $21 Billion project was only 5%.

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[8] Approaching risk analysis in this way is essential in order to curb what has been called 'appraisal optimism' and to give decision makers a more realistic view of the likely outcome of projects, instead of incomplete and misleading view on which decisions are often based today.

Few know however that the original budget estimate included $8 billion of contingencies (Morris and Hough, 1987). By allowing for risk with foresight, the programme avoided ending up in the type of large overrun that destabilizes many major projects during implementation. The Apollo approach, with its realistic view of risks, costs and contingencies, should be adopted in more major projects.

The main sources of financial risk in major projects, especially infrastructure ones are:

(i) Construction cost overruns induced by, government client, management, contractor or accident;

(ii) Increased financial costs, caused by changes in interest and exchange rates and by delays;

(iii) Lower than expected revenues, produced by changes in traffic volumes and in payments per unit of traffic.

Although less significant, financial risks are also related to costs of operations, maintenance and management. [9]

The basic strategy of risk analysis is simple: identify negative conditions from the point of view of the project and analyse the implications for the project's viability and financing. The approaches are either eliminate risk altogether, buy risk management services or allocate risk to parties that have an incentive to reduce those (spread risk).

The lessons regarding risk are:

- Risk analysis should comprise worst-case scenarios, in order to illustrate what happens if worst comes to worst.
- Public financing or financing with sovereign guarantee and no risk capital does not reduce risk or risk costs. It only transfers risk from lenders to taxpayers, and so is likely to increase the total risks and costs of a project.

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[9] Cost of risk: The condition that a project is associated with risks gives rise to an economic cost. People are normally risk-adverse and are prepared to pay something – an insurance – in order to reduce or totally eliminate risks. The cost of risk is an economic concept and reflects the maximum amount that an individual is willing to pay to eliminate a particular type of risk.

- A full risk analysis based on the MLD-principle (Most Likely Development) should be carried out as part of feasibility study and appraisal – undertaken by public-sector organizations – for any megaproject.
- Public and private investors, parliaments, media and the general public are routinely inadequately informed and misled regarding the risks involved in megaprojects, case in point being the Channel tunnel.

2.6 Conclusions (Beyond the megaprojects paradox)

The project promoters, unsurprisingly, are happy to go ahead with highly risky projects as long as they themselves do not carry the risks involved and will not be held accountable for lack of performance. Risk and accountability should be much more centrally placed in megaproject decision making than is currently the case.

The main problem with megaprojects is mainly one of risk-negligence and lack of accountability induced by project promoters whose main ambition is to build projects for private gain, economic or political, not to operate projects for public benefit. Risk and accountability are always important in the process and this is the section where focus should be made in order to make risk society less risky.

CHAPTER 3: Investigating some Megaprojects

3.1 Introduction

This chapter focuses on some major megaprojects constructed, such as the Channel Tunnel, the Millenium Dome, but also the stadium, which is currently under construction; Risks associated with those are stated and an investigation is carried out of how well they have performed or about to perform.

3.2 The Channel Tunnel

The *Channel Tunnel*, opened in 1994 at a construction cost of £4.7 billion, is a case in point, as the construction cost overruns was 80 per cent, financing costs that were 140 per cent higher than those forecast and revenues less than half of those projected.

Some may argue that in the long term cost overruns do not really matter and that most monumental projects that excite the world's imagination had large overruns. This line of argument is too facile, however. The physical and economic scale of today's megaprojects is such that whole nations may be affected in both the medium and long term by the success or failure of just a single project[10].

The Major Project Association made a study where the conclusion was that 'too many projects proceed that should not have done. (Major Project Association, 1994)

For Channel Tunnel, original estimates of viability have been rendered irrelevant by actual developments which have taken the project on a roller-coaster ride from expected high profitability to several near-bankruptcies. Most

[10] As observed by Edward Merrow in a RAND study of megaprojects: "Such enormous sums of money ride on the success of megaprojects that company balance sheets and even government balance-of-payments accounts can be affected for years by the outcomes...The success of these projects is so important to their sponsors that firms and even governments can collapse when they fail". (Merrow, 1988)

observers today consider the commercial viability of the Channel tunnel unproved and the prospect uncertain for original investors making a satisfactory profit. After being issued and by two years the share of the Eurotunnel gained almost three times the value. Then delays and cost overruns hit the project, resulting in capital shortage and crisis. Shares plummeted, bringing prices below one quarter of the peak value.

The real risks for the Channel venture were several times higher than those communicated to potential investors, as evidenced by the fact that the real costs of the project were higher by a factor of two compared with forecasts. The treatment of risk was inadequate in this project. [11]

3.3 The Millenium Dome

In July 2003, the master plan for London's Greenwich Peninsula cleared the final hurdle to clinch planning permission. In May 2002 it was officially announced that the Millennium Dome was to be turned into an entertainment centre featuring a 20,000-seater sporting arena. The UK government agreed a 999-year lease with the new owners, in exchange for a percentage of the profits, which are estimated to be £550 million over the next twenty years.

3.3.1 Management

Under the Meridian Delta proposal AEG will create, operate and carry financial responsibility for a 20,000+ capacity world-class entertainment and sports arena within the Millennium Dome structure. It is also proposed that the ancillary area of the Dome, known as the Dome Waterfront, will become a mix of leisure, eating and entertainment facilities.

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[11] In the Channel Tunnel case an environmental report was made saying no major environmental risks were identified as a result of the assessment. The authors' conclusion was that 'this report demonstrates that the Channel Tunnel represents a unique opportunity to bring about the kind of benefits which people in the environmental movement have long hoped for'.

3.3.2 The Construction

The world's biggest dome was built to celebrate the new millennium. 'The Millennium Experience', is essentially a shell and core structure able to accommodate exhibition structures, up to 40m high. In reality, the 'Dome' is an enormous stressed cable net structure, with a clear span of some 200m. Buro Happold managed the engineering design and acted as access consultants and structural, building services, fire, geotechnical and civil engineers.

3.3.3 Conclusions

Although the project in contrast with the Channel Tunnel was on budget, on time and according to what is planned, it didn't succeed (maybe because of management reasons) and all the previous stated indicate the alterations made to be used in a different manner, so as to increase its publicity. This example is exactly opposite from the Athens 2004 Olympic Games that were extremely successful, but well over budget.

Figure 3.1: Model of the Dome, (courtesy of MDL)

Source: www.sportsvenue-technology.com/projects/

Figure 3.2: Map of the Greenwich Peninsula, (courtesy of NMEC)

Source: www.sportsvenue-technology.com/projects/millenium_dome

3.4 The Wembley Stadium

After a lengthy selection process, Wembley Stadium will be the site of the English National Stadium. Work started on the 90,000 capacity stadium in the summer of 2002. The new stadium is designed to maximise spectator comfort, providing much better leg-room for all fans, unobstructed views of the action, wider seats and a new concourse wrapping around the building that will allow easy circulation and provide catering for up to 40,000 spectators at any one time. [12]

3.4.1 The construction

The main contractor is Multiplex, the Australian company responsible for the building of the Stadium Australia for the 2000 Olympic Games. The foundations of the new stadium will be up to 35 metres deep. The orientation of the stadium remains east west, with the main façade pointing north down Olympic Way.

3.4.2 Funding

The Football Association subsidiary, Wembley National Stadium Limited (WNSL), is looking to borrow £400 million towards the £760 million cost of replacing the old Wembley stadium. This will be provided by German bank Westdeutsche Landesbank. In April 2002 independent consultants Cyril Sweett, provided a value for money report to WNSL. It stated that the Multiplex contract does represent value for money.

3.4.3 Project Management

Former Millennium Dome project manager Symonds has been appointed to oversee the £700 million redevelopment of Wembley stadium. Once Symonds

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[12] The stadium, constructed over the footprint of the original 1960s Wembley Stadium, is designed with a seating capacity in excess of 90,000. It is a multipurpose stadium, designed to host football and athletics events as well as concerts.

has helped the client secure financial backing it will then manage the construction phase. It will be a traditional project management role and will centre on protecting the client's interests and liaising with the contractor. Work started in the summer 2002, with the stadium taking an estimated three years to build.

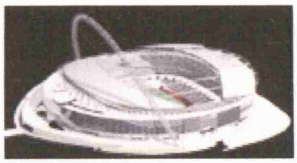

Figure 3.3: The 90,000 capacity Wembley Stadium

Source: www.sportsvenue-technology.com/projects/wembley

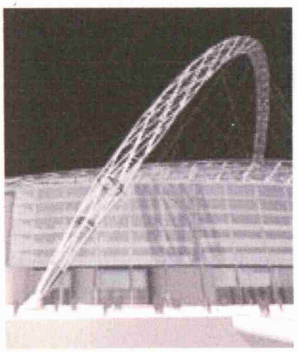

Figure 3.4: The famous 30m high twin towers of Wembley will be replaced with a spectacular 133m high arch tower ring over the 52m high stadium.

Source: www.sportsvenue-technology.com/projects/wembley

3.4.4 Problems during construction

The predicted loss is more than double the £21m and the Roberts family, which holds a 26 per cent stake in the company, had agreed to cover. The problems at Wembley have contributed to the group reducing its 2005 profits forecast to £71m from £98.2m. But chief executive Andrew Roberts said the stadium would "absolutely" be finished in time for next year's FA Cup final. "The Wembley result is unacceptable and completely overshadows the strong

results from other parts of the business," he said. The result was "extremely disappointing" and it would take time to earn back investors' confidence, he added; and costs associated with completing steel work, being able to meet the project's programme and the group's ability to recover claims against third parties were among several major risks to the project, he added. [13]

Figure 3.5: The Roberts family in trouble

Source: The Times, London, 2005

3.4.5 Conclusions

Despite the fact that Wembley stadium is still under construction, it can be seen from what was discussed above that the construction phased serious problems, especially with the seating facilities and the company which is contracted with the operation phases seriously losses over completion, because of fixed-price contract. It is a fact that Multiplex bid was well lower than other similar companies, so they won the project, but at the risk appearing to be true

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[13] Multiplex has agreed a fixed-price contract with the Football Association to build the stadium so cannot easily recoup cost overruns. "The big issue right now is that the senior management team clearly doesn't have the information systems in train to be able to understand what's going on." (Stuart Suckney, fund manager at Pengana Capital, Sydney, 2005)

that they couldn't complete in such a low budget. Time is another worrying issue: there is a possibility that the stadium will not be ready at the time agreed next year and probably extra penalty losses will affect the company.

In contrast with the Athens Olympic Games where penal clauses and economical penalties were not on value, the Wembley stadium phases such aspects because of its fixed contract. It has to be finished for a final résumé, as everybody was criticising Athens construction, but everything was done on time. The only sure thing is that as the Athens 2004 Olympic Games, the Wembley stadium will be well over budget and this time a private company has to pay for the losses, not the government.

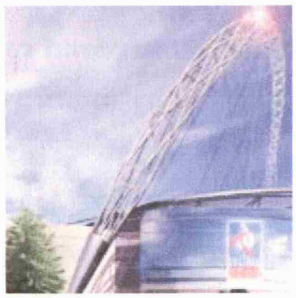

Figure 3.6: As well as contributing to overall stadium design, the lattice arch supports the sliding roof structure.

Source: www.sportsvenue-technology.com/projects/wembley

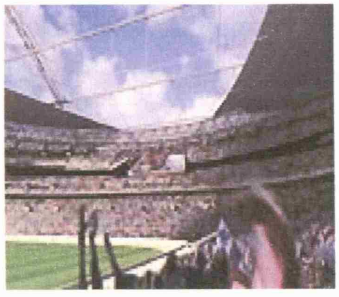

Figure 3.7: The 50,000m² roof has retractable edges on the East, South and West sections to allow sun to reach all parts of the pitch.

Source: www.sportsvenue-technology.com/projects/wembley

CHAPTER 4: Optimism Bias

4.1 Introduction

Optimism bias is the tendency for a project's costs and duration to be underestimated and/or benefits to be overestimated. It is expressed as the percentage difference between the estimate at appraisal and the final outturn. The Mott MacDonald study which is discussed here proves that historically there has been a tendency for project estimates to be highly optimistic. Optimism should, of course, be considered in respect of all project estimates (i.e. costs, duration and benefits). [14]

A reduction in the levels of optimism bias in recent years was observed in the study. This is believed to have resulted from the introduction and use of the following tools, which have improved project delivery:

- Risk management
- Partnering
- Greater diligence at the project definition stage
- More controlled cost monitoring
- Value management
- Application of concurrent engineering

4.2 Definitions and main study details

The study was a detailed assessment of 50 major projects (with costs exceeding £40m in 2001 prices) in total, comparing their planned and actual performance. Analysis of these projects has enabled the calculation of

[14] Failure to consider and actively manage the causes of optimism bias will result in cost and time overruns, and benefits shortfalls over and above those that could be achieved if the causes are identified and actively managed. However, by taking account of risks when defining the nature and scope of project and then developing strategies for the effective management of risks, it is possible to reduce the optimism bias and raise confidence levels in project estimates.

optimism bias levels for certain project types and an assessment of optimism bias trend over time.

Optimism bias can be represented as follows:

$$Optimism\_bias = 100x\frac{(Actual - Estimated)}{Estimated}\%$$

An assessment of the typical optimism bias levels in the public sector provides an indication of the level of confidence within estimates of project costs (excluding the effects of inflation and change in taxation), duration and benefits. All projects involve risk, which implies a cost to the bearer of that risk.

Risk management in the public sector should aim to eliminate those issues that cause cost and time overruns and benefits shortfalls. The project costs (capital and operating expenditure and unitary payments), duration or benefits are considered optimistic when they do not fully reflect the chances of cost and time overruns or shortfalls in the delivery of project benefits. [15]

When allocating budgets, public bodies have to prioritise their investments, with the aim of maximizing the value for money of their spending. This requires the use of appraisal methodologies. At any stage during the project life-cycle, the project costs and time required to deliver the project benefits are difficult to forecast accurately. Evidence has shown that public sector estimates tend to be optimistic.

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[15] "*In all things, success depends upon previous preparation, and without such preparation there is sure to be failure*". Confucius (c.550 – c.478 BC)
"*Optimism in project estimates comes from a lack of experience; therefore the tendency to make optimistic project estimates can be minimized by learning from past projects*".
Anonymous

4.3 The Mott MacDonald Study

The projects studied were of 6 categories: standard and non-standard buildings, standard and non-standard civil engineering projects, equipment & development projects and outsourcing projects.

In order to identify appropriate optimism bias for current and future projects, it is necessary to review past projects and take onboard any possible lessons learned.

The results adjusted for changes and recent trends in the procurement and management of projects. The study presents the most likely upper and lower bound values of optimism bias for each project type with respect to works duration, project duration, capital and operating expenditure and benefits shortfall

The 5 project risk groups identified are:

(i) procurement related
(ii) project specific
(iii) client specific
(iv) environmental
(v) external

The actual works duration is compared to the works duration estimated at outline Business Case (BC) and contract award. The works duration optimism bias can be represented as follows:

$$Works\_Duration\_OB = 100x\frac{(Works\_Duration_{Actual} - Works\_Duration_{Estimated})}{Works\_Duration_{Estimated}}\%$$

The measured optimism bias does not give any indication of whether the project was delivered on time, but only reflects the extent to which the works duration has increased.

4.3.1 Observations

It is expected for standard projects to have smaller Optimism Bias (OB) levels when compared to non-standard projects and this is the case for the

buildings project type. However, for civil engineering projects, the study shows a higher works duration optimism bias for the standard projects as opposed to non-standard projects. [16]

The following project risk areas have contributed to OB:

- Design complexity
- Information management
- Technology
- Site characteristics
- Public relations

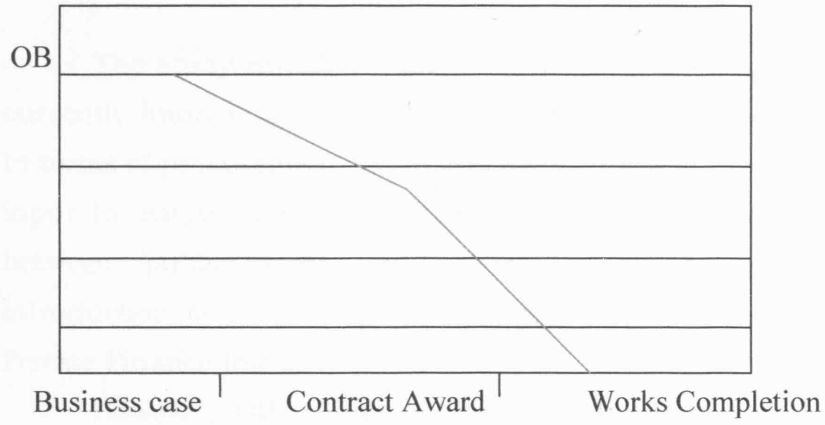

Figure 4.1: Typical Optimism Bias (OB) during project life-cycle

Good project intelligence is essential when preparing a business case. The risk is increased where projects have unexpectedly long gestation periods and can be mitigated through scenario analysis at initial definition stage. [17]

Therefore, Mott MacDonald recommends that a process actively promoting knowledge transfer and knowledge sharing should be put in place. Adopting the following will allow continued improvements through the lessons learned from completed projects:

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[16] The standard civil engineering project type mainly comprise of road projects, which tend to be susceptible to environmental impacts, giving rise to high works duration OB in the study.

[17] "*Those who do not learn from the past are condemned to repeat it*". Anonymous

- Methodical activity of key project requirements
- An open approach to sharing the successes and failures of major project procurements, through internal and external seminars, papers and similar.
- Post completion, one year after completion and five years after completion audits to compare project outturns against projections, together with wide dissemination of lessons learned.

4.4. Recommendations for Current/Future Major project requirements

The study revealed evidence that lessons learned from past projects are currently improving the estimation of project costs, time and benefit delivery. In terms of procurement, there has been a general, but not universal, shift from input to output specified requirements and a change in the risk allocation between public sector and those implementing projects through the introduction of partnering, outsourcing arrangements and, in particular, the Private Finance Initiative (PFI).

However, OB remains significant throughout the project life-cycle for unique projects, those with innovation or new technology, or projects with complex interfaces. In these cases alternative solutions or changes to business processes or project goals which can reduce risk have to be considered. [18]

Uncertainty in the external environment causes changes to both project costs and benefits. For example, changes in design or construction standards often lead to changes in project scope, which may result in cost and time overruns. Projects may be influenced by the following external project risks:

(i) Political influences: risk of changes in policy is normally carried by the public sector.

(ii) Social changes/public relations:

[18] It is difficult to achieve full accountability and commitment to cost, time and benefit and benefit delivery within the public sector context due to movement of key project team members and level of decision-making authority delegated to project teams and public sector culture.

(iii) Economy: Shocks such as the oil crisis and the macro-economic business cycle had a marked impact on some projects and the 1980s included significant economic and social changes.

(iv) Institutional influences: Many public projects have strong advocates.

(v) Legislation and regulation: Issues such as change in legislation continue to influence variations in project-cost and time.

(vi) Market Size and Concentration: The balance of supply and demand and the number and strength of competitors in any market, continue to influence pricing although it is uncertain as to how pricing will be affected.

(vii) Technical Novelty: "*It must be remembered that there is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage, than the creation of new system*" Machiavelli. There continues to be optimism regarding the extent to which technical novelty (uniqueness, innovation and utilization new technologies) can be delivered.

The management of successful projects has shown that appropriate emphasis should be applied to reviewing the project objectives, scope, specifications and definitions detailed in the business case to ensure that they are fully comprehensive and address the whole requirements of the project in the short, medium and long term. [19]

4.5 Conclusions

The Optimism bias recorded for projects in several recent studies have proved that there is a tendency for project managers and project owners to underestimate costs and time, and overestimate benefits for a project.

Failure to consider and actively manage the causes of optimism bias tends to result in an accumulation of unforeseen cost and time overruns, and benefit shortfalls. However, by developing strategies for the effective

[19] "*Change should be a friend. It should happen by plan, not by accident*". Philip Crosby

management of project risk areas, it is possible to reduce the optimism bias and raise confidence levels in project estimates.

The reduction in optimism bias with time, as observed in the Mott MacDonald study, is most likely attributed to the introduction of risk management, improved procurement practices (based on greater diligence at the project definition stage), partnering, more controlled cost monitoring, value management, and the application of concurrent engineering.

The Mott MacDonald study has strongly indicated that the most important contributing factor to OB was the inadequacy of the business case (e.g. Project scope not clearly defined and/or stakeholders' interests not addressed). [20]

The application of current industry best practices, recognized strategies to manage all project risk areas and effective project management will reduce the optimism bias recorded in future projects. [21]

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[20] Appropriate emphasis should be applied to reviewing the project objectives, scope, specifications and definitions detailed in the business case to ensure they are fully comprehensive and address the holistic project requirements in the short, medium and long term.

[21] This study recommends that prudent levels of optimism bias should be assumed in project costs and time estimates until good practice in procurement has been demonstrated and independently verified.

CHAPTER 5: Managing risk and Uncertainty effectively in construction projects

5.1 Introduction

Risk: an uncertain event or set of circumstances that, should it occur, will have an effect on the achievement of the project's objectives. (UK Association for Project Management (APM), 1997)

Risk Management is a systematic, formalized approach to the tasks of identifying, assessing, treating and monitoring uncertainty. Knowledge on risk should be recyclable in a project. Approach an activity session with risk possibility. The whole thing is washing around. Shifting sands for the whole project leads to things that they never consider.

Communication of parties is very important; it means flexibility to various activities. The procedures to be followed are taking risk as a basis and try to manage it (try to guess various risks that can appear during the project). Risk may re-appear, so keep a risk register updated; track the changes and the manager should interfere where necessary. [22]

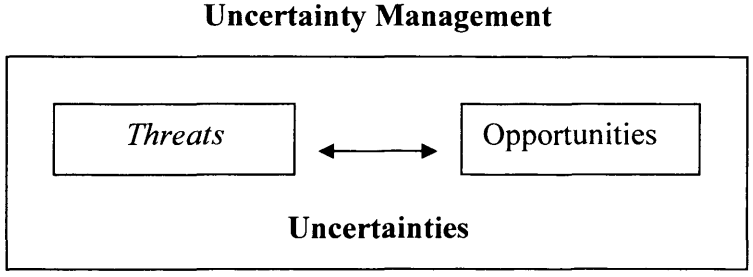

Figure 5.1: Managing Uncertainty
Source: Stephen Ward lecture notes on Risk (2005)

[22] Project Risk is the implications of significant uncertainty about the level of project performance achievable. A source of risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on at least one project objective... (Project management Institute, 2004)

5.2 Risk and Uncertainty fields

All projects involve risk – the zero risk projects are not worth pursuing. This is not totally intuitive, but also a recognition that acceptance of some risk is likely to yield a more desirable and appropriate level of benefit in return for the resources committed to the venture. Risk involves both threat and opportunity. Organisations that better understand the nature of risks and can manage them more effectively cannot only avoid unforeseen disaster, but can also work with les contingency and tighter margins, setting free resources for other endeavours, while seizing opportunities for advantageous investment that might otherwise be rejected as 'too risky'.

Innovation is associated with risk in construction projects, as construction industry does not follow the saying of others, i.e. pharmaceuticals, 'innovate or die'. When construction companies innovate in a construction project, they have to be very careful with uncertainty and make sure that trust is present with all the members involved, so as to minimise uncertainty from an aspect. The client is the party that holds all means (except technological ones and that is why he hires the consultant and architect), motives and opportunities to innovate especially when he is working with trusted companies, in that case he will invest more. On the other hand the architect does not have the financial means, motives and opportunity as his role is re-active and not pro-active; he is tight to a specific contract with the client. The 'engineer' (=contractor) possesses the means, but not the motives and opportunities. (*Ive, 1995*). [23] Athens 2004 innovated by means of constructing new projects with the use of different technology.

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[23] *Architects* have opportunity to innovate, but only in a pro-active manner. They lack means (especially financial) as being under-capitalised and motives.

Contractors are, on the other hand, re-active in the opportunity to innovate. They the means, but usually don't use them fully. They also have motives for cost reduction, but usually not innovation.

Finally, *clients* have the means (financial), opportunity and motives when they seek for something new, but lack the technological means; hence employ a contractor to do the job. (Ive, 1995)

Risk is present in every aspect of our lives; thus risk management is universal, but in most circumstances an unstructured activity, based on common sense, experience, instinct and relevant knowledge. Project management has evolved over recent years into a fully-pledged professional discipline characterised by a formalised body of knowledge and the definition of systematic processes for the execution of a project. Yet project risk management has, until recently, generally been considered as an 'add-on' instead of being integral to the effective practice of managing projects. Uncertainty and risk might be defined in terms of the threat to success posed by a given plan; the size of possible cost overruns and their likelihood.

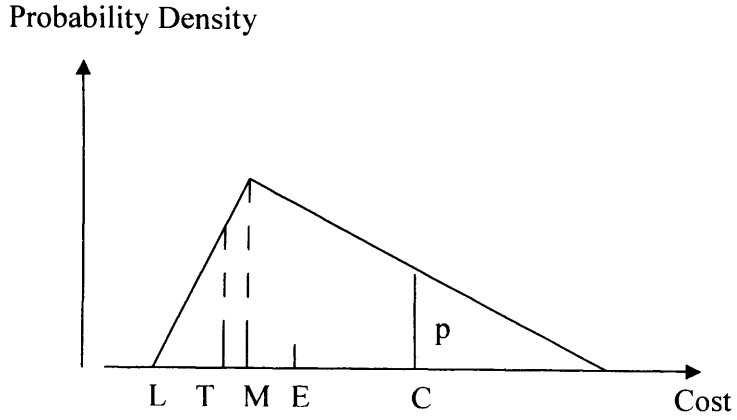
As Rudyard Kipling said: "I keep six honest serving men, they taught me all o knew; their names are What and Why and When and How and Where and Who". Following that phrase the roots of project uncertainty are associated with the question, which follow:

(i) Who are the parties involved?
(ii) What is the nature of project?
(iii) What are the parties' motives?
(iv) How is the project to be executed?
(v) When does it have to be done?
(vi) What resources are required?

Some of the most common areas of risk and uncertainty are premature definition, definition of objectives, multiple parties, contracts and lack of change controls or extended liability. [24]

[24] In order to manage those kind of uncertainties in a project life cycle the manager has to modify to design base plans, consider the complete life cycle, monitor or manage the risks, develop contingency plans (for cases when things are not heading according to plan) and definitely evaluate continuously; as indicated before evaluation has to be ongoing through the whole cycle as risk reformulates and is always present. If the above 'rules' are not followed somehow totally or even partly, then estimates can go wrong.

5.3 Targets, expected values and commitments



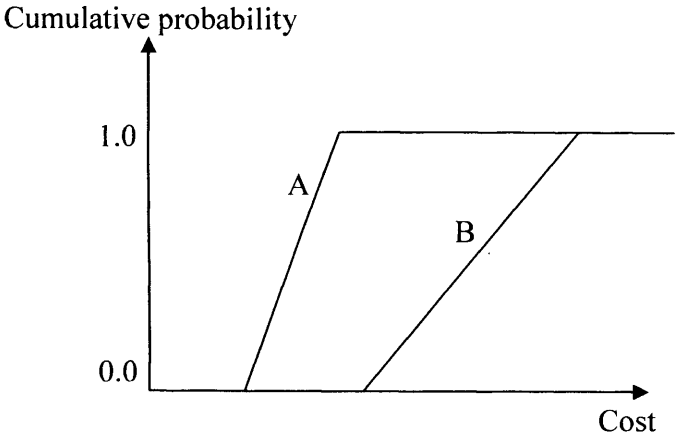
Target T has only about 20% of being achieved or bettered

Expected cost, $E = \frac{(L + M + H)}{3}$

Where p = probability of cost being higher than

Setting a contingency level C, should be based on what level of p is acceptable.
C is the level of commitment, but its allocation requires careful management.

5.4 Choosing alternative actions (cumulative probability curves)



Option A
DOMINATES
Option B

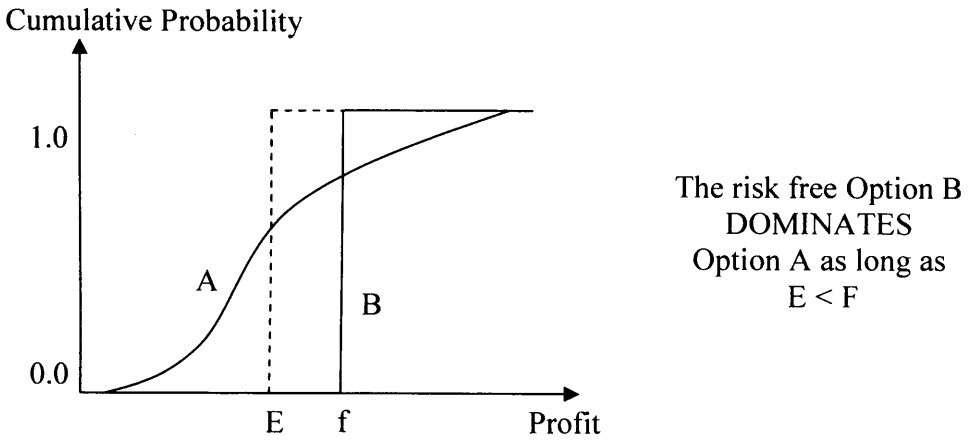


Figure 5.2: Cumulative probability curves
Source: Professor Stephen Ward's note on Risk (2005)

Stephen Ward developed some models for alternative actions which are shown above. [25]

5.5 Conclusions

It is very important for the manager in order to ensure that risk and uncertainty are well under some control to include some means of risk management tools; of course those are not always accurate and can lead to mistakes, but it is experience and previous similar applications the most important aspects that can guarantee safety and continuation for the project cycle.

Effective implementation would then mean provision of motivation, insurance of sufficient time and resources, improvement of the understanding of what is involved and last but not least introduction of systems for coordinating and controlling the process of Risk Management; with the correct skills.

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[25] Following the above graphs it is important to understand that the main issues in analysis are determining what to quantify and in how much detail, awareness of assumptions, quality of estimates and of course appropriate scope when involved in the project.

CHAPTER 6: Case Study: The Olympic Equestrian Centre

6.1 Introduction

The Olympic Equestrian Centre is located in Markopoulo, in eastern Attica, a facility that includes air-conditioned stables for 300 horses. There are 20,000 seats for the jumping event, 8,000 seats for the dressage of the horses, and 40,000 seats for the cross-country event. As indicated in the introduction it happened to be the largest project of all.

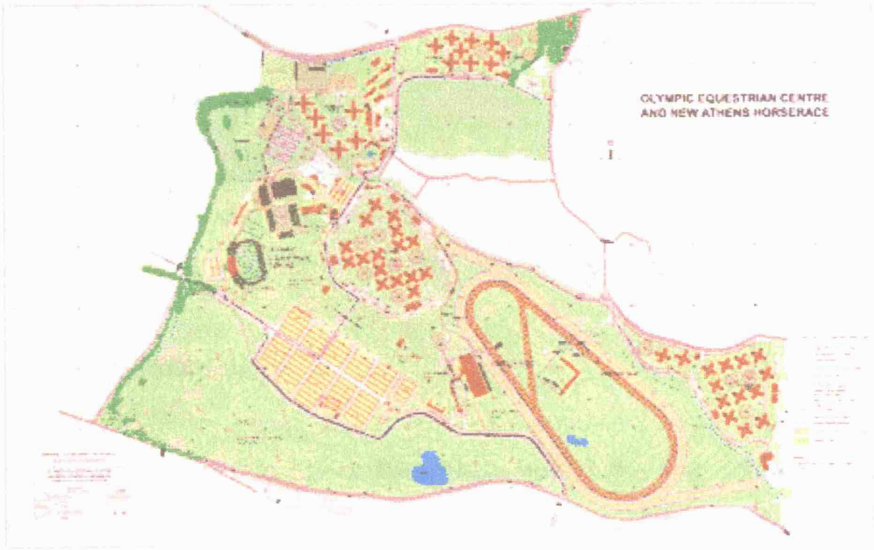

Figure 6.1: The Olympic equestrian centre and Athens horcerace at Markopoulo
Source: www.eventers.co.nz/weg_olympics/olympics_index.shtl

6.2 Historic and Cultural issues at the Equestrian centre

A marrying of a 5,000 year history with cutting-edge construction technologies came about on a plot of 2,117,000 m^2 to the east of Markopoulo in Attica, in a location called Merenda. When the contractors for the Olympic equestrian centre and the new Athens race course commended the excavations, they encountered more than 21 archaeological sites from prehistoric times, the classical and the Byzantine eras. The project area coincides with the area of the Myrinounda community of the classical era and the findings made by the

Archaeological Service brought into evidence a sustained, organised presence over the past 5,000 years. [26]

Figure 6.2: Markopoulos equestrian centre location near the new airport

Source: www.eventers.co.nz/weg_olympics/olympics_index.shtl

6.3 Main Design Principles

The design of the Complex has been based on the some principles and those were to be followed during the whole construction phase. The fulfilment of all requirements for spaces and functions as set within the building programme was crucial. [27] The last, but not least principle followed was the exhibiting of archaeological findings for appreciation of the visitors; ancient

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[26] As a continuation of this presence and as a direct link with the past, the final historical link needed to be added, namely one of the largest projects for the 2004 Olympics, capable of accommodating as many as 70 thousands spectators and constructed with technologies never before used at the Olympic Games for such a hugely popular sport; i.e. good night vision capabilities so that part of events could be completed at night as well.

[27] The layout and formation of the volumes of various buildings was constructed in such a way, so as to give the impression of belonging to the complex, despite being part of different groups.

findings were visible to the public in various parts around the equestrian centre.

6.4 Client issues and construction

The invitation to tender for the whole project has been issued by the General secretariat for sports in the "Lump Sum design and construction" system. The contract was signed on 10/1/2002 and the construction lasted 720 days, a little less than 24 months, despite the difficulties which arose from the need to excavate for ancient finds. The project employed periodically 3,000 people and used 193 companies as sub-contractors. [28] The contractual lump sum amounts to 181.029.082n Euros plus VAT, while the final one was 214 million Euros as extra construction services took place. The project was constructed by the joint venture "ETETH S.A. – J&P (Hellas) Avax S.A. – GEK S.A. – C.I.SARANTOPOULOS S.A.".

There were two clients involved: ODIE (Organisation Conduct Horse Racing of Greece, this is a national body) and Ministry of Culture. The management of the project was hosted by General Secretariat of Sports (as a special service for public works). It conducted the Supervision and administration of the convention. ODIE was linked with the New Hippodrome of Athens (a whole project with under this name), while Ministry of Culture was linked with the other part of the project which is named Olympic Equestrian centre. [29]

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[28] For a full sub-contractors' list refer to Appendix F.

[29] Both of the parts were constructed as a unite project with the gravity of Olympic Projects. The Olympic equestrian centre had gravity as a clearly Olympic project; the Hippodrome was constructed together with the Olympic project, so it had to keep pace in time with it and on the other hand it had to be transported and settle from Faliro (was the previous host hippodrome) to Markolpoulo as quickly as possible; this was because other Olympic works were hosted in Faliro Complex. Hence, even if it wasn't, the whole equestrian centre was faced as an Olympic project.

Figure 6.3: Construction at its final stage

Source: Joint venture's database

The organisation Athens 2004 was just a tenant, it came on August 2003 for the test events and afterwards on May 2004, becoming a resident of the complex until the end of the Paralympics on October 2004. [30]

Construction works usually in Greece 'suffer' during surveying phase, as they happen to finish at the last moment and are not sufficient; therefore, when the construction stage starts problems appear , which cause alterations (many times we reach large numbers in extra time and money), causing difficulties to the contractor and the client; this is usually one reason why recently clients are no longer also administrator of the convention as before (modern management). An example would be if I am the owner and I want to build a building, there will be an administrative engineering company (consultant) and a contractor.

[30] Athens 2004 used the centre, introduced some operation directives (as the normal operation was hosted by the concession), operated the Event (Olympic equestrian games), supervised some works that needed at the time (i.e. some extra wires) with the attribute of being the user and tenant for those months only.

Delays cause problem to all three parties, with more appearing for the client (has to pay more money) and the contractor. (Goumas, 2005)

Usually, time extensions are given without any penal clauses; the problem is the extra money to be paid. Such problems existed in the particular project, but not large in proportion with the size of the whole project.

The two basic problems to overcome during construction were:

(i) Archaeology

(ii) Alterations ordered from the Olympic committees.

Other than that the conditions were good enough.

Figure 6.4: The equestrian centre finalised

Source: Joint venture's database

6.5 Environmental issues

It should be noted that while construction works continued at the site of the Markopoulo Olympic Equestrian Centre, healthy and big olive trees have been removed from the site in order to be preserved and replanted upon completion of constructions. It was indeed a simple and innovative solution

that. In this way, olive grove made up of 100-year old trees allowed for construction works to proceed. At the same time, Olympic Venues would need big trees and hence those were replanted in many locations. [31]

Figure 6.5: Keeping trees alive and replanting them during construction
Source: www.athens2004.gr

6.6 Post Olympic usage

The racecourse complex will continue to operate after the 2004 Olympic Games as well. As far as the installations at the Olympic Equestrian centre are concerned, they provide a variety of different uses and ways of development. For the time being, the dominant thoughts are in the direction of creating riding schools and places appropriate for children's entertainment, creating sports fields for various sports which can be used by the sports clubs and youth clubs in the area. Other possibilities offered by the installations are, for example, to use them for horse riding competitions and to use the reception areas to host events. Once the new road access network to the region has been completed, it will be even safer to turn these installations to good use.

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[31] The trees were loaded on special lorries and transferred to a nursery garden, where they were preserved. They were kept there under special environmental conditions until they were April 2004 and they were replanted at the Olympic venues of Schinias Rowing and Canoeing centre, Equestrian centre, Faliro Coastal zone complex and Hellinico Olympic complex.

Chapter 7: Analysis of the Equestrian Centre

7.1 Introduction

This particular chapter focuses on the analysis of the Olympic Equestrian centre. There is selective indication of the interviews conducted in order to compare the literature with the real case study; but also comparison is performed between the venue and other important projects conducted in Europe, such as the Channel Tunnel or the Millennium Dome. The aim is to prove the literature that was discussed in the initial chapters. The comparative points will hopefully lead us in important conclusions both for the Athens 2004 Olympic Games, but others to follow also. As a matter of fact the London 2012 Olympic Games are on their way and it will be important to understand some aspects of the report, in order that mistakes of the past can be foreseen and avoided.

7.2 Questionnaire and Interviews (procedure)

A questionnaire was prepared before visiting the site of the equestrian centre in Greece; in that way it was made sure that all important aspects would be covered when talking with associates of the concession. The initial idea was that by interviewing particular people of the joint venture, through semi-structured open-ended questions, useful data could be collected for the equestrian centre in particular, but also for the whole Olympic Games' venues as well in some cases.

The choice of the people to interview was vital, as they had to be part of three different companies, which led the concession, so as to get various answers through discussing and therefore, investigate what the various parties thought for the same project. The person in charge of the concession, the project manager was Mr Thanassis Choundas, a true leader who overcame all the problems met during the construction phase and hence conducting an interview with him was of particular priority; he has worked for many years abroad and had a very god understanding of construction matters worldwide and a good crisis to compare issues. The second person to interview was Mr

Giannis Goumas, mechanical engineer of J&P Avax, with previous experience in oil industries and particular knowledge of specific details about the project, which were very useful at the end; i.e. client issues or involvement of various parties in the design. The third person to interview was Mrs Argiro Zerva, a surveyor of Sarantopoulos S.A., whose knowledge of surveying studies before the initiation were useful, but who could also comment on aspects of the Olympics as whole, as her sister was leading a team in an area of the Olympic stadium. All engineers interviewed were chosen for a particular reason as indicated above and their help was vital in the case study.

7.3 Equestrian centre, Megaprojects and risks

Flyvbjerg et al., 2003 views of megaprojects and risks associated with them were reported on Chapter 2. A comparison, though, between those cases and our particular one, is to be examined. The main question which were asked in the interview are briefly described upon matters of *bureaucracy*, large number of *sub-contracting and lack of resources*, change of *governing body* just six months before the Olympics and *archaeological* matters.

Flybjerg suggests that there can be a great range of *political issues* that can delay a project. The elections of March 2004 didn't play any role in the equestrian centre, as the works had already finished by then as well as most of other projects were on their finishing line, according to Giannis Goumas.

Bureaucracy is always a big issue in Greek State, as Thanassis Choundas suggests. Even the Olympic projects were not able to overcome bureaucracy totally. [32] This fact comes to prove right the authors of the book "Megaprojects and Risk", who suggest that bureaucracy, can cause extreme delays and cost variations in the normal running of works.

The two basic problems with *sub-contractors* were: (i) there were a great number of them used, because of the extent of the project and (ii) some of them were not of the adequate quality and didn't always keep their word. The time was minimal and the work to be done massive. Too many works around municipality of Attica, so the percentage of non-reliable sub-contractors was

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[32] It did not cause massive delays, but this was only because the private concessions were trying hard to overcome bureaucracy and not to lose valuable time.

high; and also there was a lack of using all sub-contractors that the companies had already worked together with in the past. Some sub-contractors were used, that might have not been used if the situation was different. (Giannis Goumas, Argiro Zerva). Bruzelius confirms such a case, saying that there are a lot number of unexpected issues to face in a project.

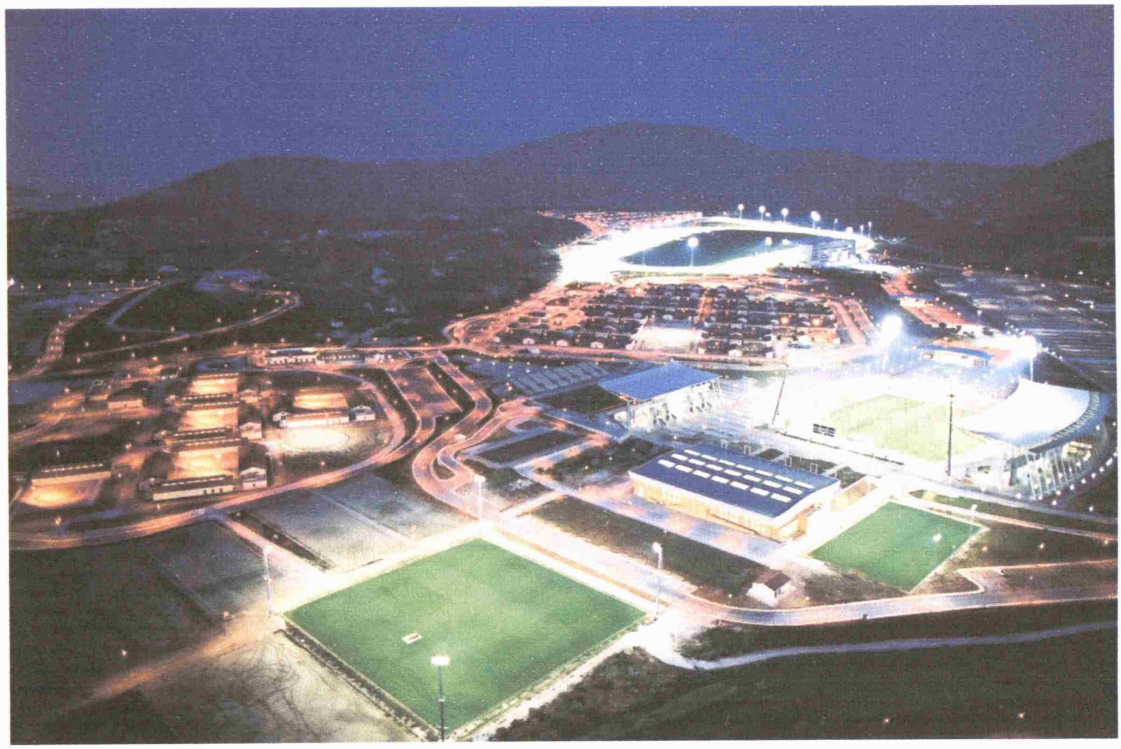

Figure 7.1: A night view of the completed equestrian centre
Source: Joint venture's database

Archaeology in Greece is of great value. The whole project was constructed over an ancient city, municipality of Merinos, a suburb of Athens dealing with agriculture and trade. They knew that before the works started, but it was decided that the Olympic equestrian centre would be constructed at that place. When the excavations started, problems began, most of which were not foreseen. [33]

[33] The authorisation was given in an every day basis; you could excavate nowhere, if an archaeologist didn't sign the relative authorisation, unless it was somewhere where excavation took place before. This is valid everywhere in Greece, but here particularly was ten times as strict, because of the ancient settlement.

There were three cases when something was found:

(i) The ancient finding was presentable, but without value (in archaeological criteria), which meant that an order was given to demolish it and continue construction.

(ii) The finding was presentable, with some value, so their workers took what they needed and the construction continued.

(iii) The worst case was when the ancient finding was perceivable and visible. If the concession had an important part of a building there and archaeologists insisted it should be moved, then design had to be altered something that happened in 2-3 cases. [34]

Figure 7.2: Archaeological walls were preserved

Source: Joint's venture database

[34] Cases such as (i) and (ii) were taking place every day that caused delays. E.g. the central stables were delayed to start because of a lot of ancients at that part and then acceleration of works was required. Case (iii) took place twice; although great efforts were made for the design not to alter (movement of the building in the drawing), Archaeology and Ministry of Culture interfered, hence Grand Stand was moved.

Archaeology department delayed and increased the price, as instead of using 30-50 workers, who were believed to be needed in the beginning, 400 were used. In order for the final milestone not to be delayed, acceleration of works took place, which meant more money; archaeological findings are national treasure anyway. The above information on archaeological issues was given by Mr Giannis Goumas as part of the interview. [35]

The authors comment that it is becoming clear that many large projects have poor performance records in terms of economy and environment. Cost overruns and lower-than-predicted revenues frequently place project viability at risk and redefine projects. [36]

A step towards reducing cost overrun is to acknowledge that a substantial risk of overrun exists and cannot be completely eliminated; but can be moderated. Another one is to allocate the risk of overrun to those best able to manage it. Such suggestions were followed in the equestrian centre, by moderating archaeological issues risks, but also great leadership skills to be seen by project manager, Mr. Choundas. [37]

As it can be seen from the above indications theory and practice coincides very closely and finalises one another; different aspects always appear, as the archaeological issues, which are of great importance in Greek land, but generally the risks are obvious and managers are obliged to cope with them in a manner, so as to keep the Golden triangle Cost, Time, Quality in good regions.

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[35] For more details go to Appendix B. As Mrs Argiro Zerva commented "*Archaeologists were working on their own tempo, no matter what the project needs were and hence great difficulties were experienced*".

[36] Sub-contacting issues, archaeology and political issues are examples of some areas, which can not always be foreseen, but are there to increase risk and uncertainty during construction phase.

[37] As Mr. Goumas stated, if it wasn't for Mr. Choundas's personality and strength, the project would never have finished on time. Good managers and leaders are needed in construction projects even in our days.

7.4 Equestrian centre and Optimism Bias

In this section optimism bias is revised following Chapter 4 and compares the Mott MacDonald report's (Preview of large public procurement in UK, 2004) situation with the Olympic centre. The questions asked in this section had to do with *optimistic bidding* and *reliability or existing fame* of companies chosen for the project.

The initial value is smaller, as later additional works take place. There is generally such a tendency (all projects turn out to be more costly of the initial budget). It is a fact that the *financial offers* are lower for a number of reasons. One is lack of correct valuation, another is what happened with many with the Olympic works as Mr. Choundas, which is because the venue was constructed, something additional needed could be built at the same period; i.e. fire station. This didn't mean that the project was overdue, because new work was added to the initial estimates, which was separately paid of course. Another reason of overdue amounts was archaeological issues; of course archaeology in construction cannot be characterized as unexpected in Greece, but it cannot be exactly estimated. [38]

The interviews outcome was exactly what Optimism bias report of Mott MacDonald concluded; the fact that the OB was recorded for projects in several recent studies have proved that there is a tendency for project managers and project owners to underestimate costs and time, and overestimate benefits for a project. Although in the case of equestrian centre it was proved that by developing strategies for the effective management of project risk areas, it is possible to reduce the OB and raise confidence in project estimates and biddings. On the other hand, though there were other cases where costs were way over bidding, like the Olympic stadium.

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[38] Nevertheless, "you cannot add in the initial estimate more because you will never win the project; ancient findings, thunder spoiled a part, those are higher call, hence the price is increased. There are no legal issues (if late, while we have agreed in a particular solution, then yes they could appear). Here it wasn't necessary and as a matter of fact the concession was claiming some extra money that never got". (Choundas, 2005)

The offer and entrusting for the project was conducted after grading and the 'Absolute under-bidder law' was not considered for all the Olympic works. Companies came forming a concession, after the client's invitation; those concessions competed and examined with the method of grading and not by using the absolute under-bidder. [39]

7.5 Project risk management at the Equestrian centre

As mentioned in Chapter 5, all projects involve risk. Organisations that understand the nature of risks and can manage it more effectively can work with less contingency and tighter margins, setting free resources for other endeavours, while seizing opportunities for advantageous investment that might otherwise be rejected. Questions involved *complexity* matters, *information flow*, *safety* issues, *and lack of experience* for hippodrome, *cost overrun*, *experience* gained and *lessons learned* for future use in this section. [40]

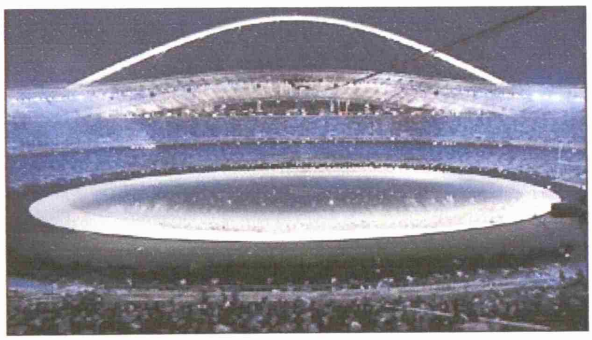

Figure 7.3: Opening ceremony in Olympic Stadium
Source: www.athens2004.gr

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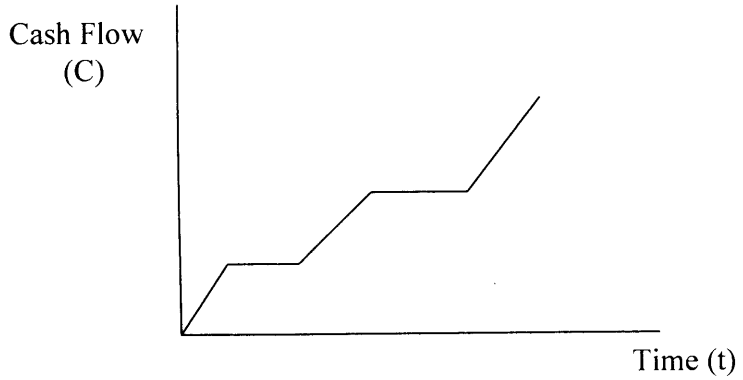
[39] The winner might produce a more expensive bid, but each concession provided different characteristics. The *companies preferred* after marking and competition, were the best and most serious in Greece. The system of absolute under-bidder was not used in the particular case and in the whole of Olympic venues.

[40] Effective implementation would then mean provision of motivation, insurance of sufficient time and resources, improvement of the understanding of what is involved and last but not least introduction of systems for coordinating and controlling the process of Risk Management; with the correct skills. (Chapman & Ward, 2005)

In the case study now, the maintenance cost is high (grass irrigation, grass cutting, taking care of the arenas) as Mr. Goumas indicates, who is still working or maintaining the venue. From one point of view, the fact that the construction conventions' allocation were late was a disadvantage, as works were on a rush; but on the other hand an advantage as well, economically, as the works finished 3, 5, 1 month before the venues. If they finished earlier the maintenance cost would be enormous, especially for the particular project, which is a 'living construction' (plants, grass etc). The equestrian centre finished on 2003 and was maintained until 2004.

It is not an absolute fact that the construction was *late* in *over cost* in all cases; it might be deliberate in some situations (according to Mr. Goumas opinion some venues were programmed to be late, so that the maintenance cost was lower). The fact that the conventions were signed late was an advantage for the government, as it gave away the projects in lower prices. The equestrian centre has a maintenance cost at the moment and after the Olympics of 500000 euros each month (not including racing condition, but only maintaining buildings, arenas etc) and the concession is in charge of doing so; this is a good income for the companies forming the concession. If the centre had to be combative for racing conditions all the time, the maintenance cost would be increased by 20-30 per cent;[41] *Cash flow* was maintained in a good level and this is because works were doing well, hence confirmations of timing succession, hence payments.



The graph is an indication of the cash flow in accordance with time of the project during its construction.

Figure 7.4: Cumulative Cash flow during construction (Goumas, 2005)

[41] In August 2003, when test events took place and thereafter the centre was ready for hosting Olympic Games in a 90 per cent percentage. In general Olympic Games were hosted with enormous success.

Olympic Games were a great *experience* constructively, managerially and with respect to time. Deciding rapidly, pushed by time for important issues gives you a great ability; managers or engineers can be mistaken, but still they gain experience. The experience is here, but I do not know where it can be used now that Greek construction community faces a recession. The country has to open new 'rivers' in order to promote the human force towards new 'horizons'. For Greek construction 'community' the experience gained from Olympic Games was very important, especially for Greece, which is a relatively small nation compared with other countries. (Argiro Zerva, 2005) [42]

Lessons learned are a matter of organisation. If the project succeeds without organisation in only a matter of luck and will happen once or twice. The fact that Greeks finish everything during the last minute is not what should remain from the Olympic Games Organising is extremely important for everything to succeed and this is where the future will depend. There were organised companies that drifted others to success. (Giannis Goumas, 2005)

The equestrian centre was a *special project.* Nobody in Greece knew how to construct a hippodrome. [43] The design that Greek consultants made, concerned only the architectural-mechanical-structural-electrical part. The slopes of the tracks, turns etc. were designed by a foreign 'adviser', who was paid for his service. This is exactly what Flyvbjerg comments on: 'Special projects need special treatment and different planning'.

There were two advisers that took part in special designs. The one was a French company that dealt with hippodromes all over the world and gave indications, e.g. 2 per cent slope in a particular part of the track; after such specifications the construction was not a problem for the concession. The other one was a person that IOC (International Olympic Committee) suggested and he

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[42] Private Finance Initiative (PFI), which is about to be in value in Greece is a good example, as well as companies can move some construction in East countries. When private companies are involved with construction and maintenance of a project, it has been proved that it works better (like Rio-Antirio Bridge, Attica Road, Spata international airport). (Thanassis Choundas, 2005)

[43] The existing one was built in 1924 by English people at Faliro and until 1967 the president of the hippodrome was British. Hence, specialist designers came for the main track and cross country (where triathlon took part).

dealt with jumping, dressage and cross country arenas; he used his experience from previous Olympics. Especially the second one was very strict in the specifications he gave and his orders should be followed for the slopes, otherwise there would be the possibility that the track would not be received by Athens 2004 for the games. (Argiro Zerva, 2005)

The *Information flow* and *relationships* between the companies forming the concession were positive on Mr. Choundas' thought. This is a point of attention, as usually during concessions, in Greek field but also generally all around the world there are problems between the companies' relationship. This is following what Nigel Smith, 1999 suggests that risk is minimised when information flow is good between companies and relationships upon individuals are 'healthy'.

The *safety* issues were demanding, not especially because it was an Olympic project, but because the time was minimal and the work massive. Lots of work in little time is always negative for safety. The companies had to safeguard accidents and in general terms this was achieved. There were seminars where possible and the concession has hired and paying lots of money in a safety director. [44]

7.6 The equestrian centre in comparison with the Channel Tunnel

The *Channel Tunnel* had changed safety requirements as a main cause of overrun. The real risks for the Channel venture were several times higher than those communicated to potential investors, as evidenced by the fact that the real costs of the project were higher by a factor of two compared with forecasts. [45]

On the other hand, the *Olympic Equestrian centre* was a state of art project as it was innovative as the Channel tunnel, but also and most

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[44] According to Mr. Goumas' personal opinion, the safety issues could be better; we only reached a percentage of 50-60 per cent of other European companies.

[45] A supportive point for the tunnel was the obvious fact that it is much more demanding to work underground than in other conditions. The treatment of risk was inadequate in this project.

importantly in accordance to cost and time; it was even completed two months earlier than schedule despite the great problems that archaeological issues cause as discussed in previous chapters. Risk such as archaeology, was foreseen before initiation (maybe in not such a great extent obviously), cash flow was according to plan (as shown in figure 7.5) and the management model followed was practiced for the first time in a Greek project (the whole concession was working as one part) and turned out to be particularly successful and vital for the completion of the project.

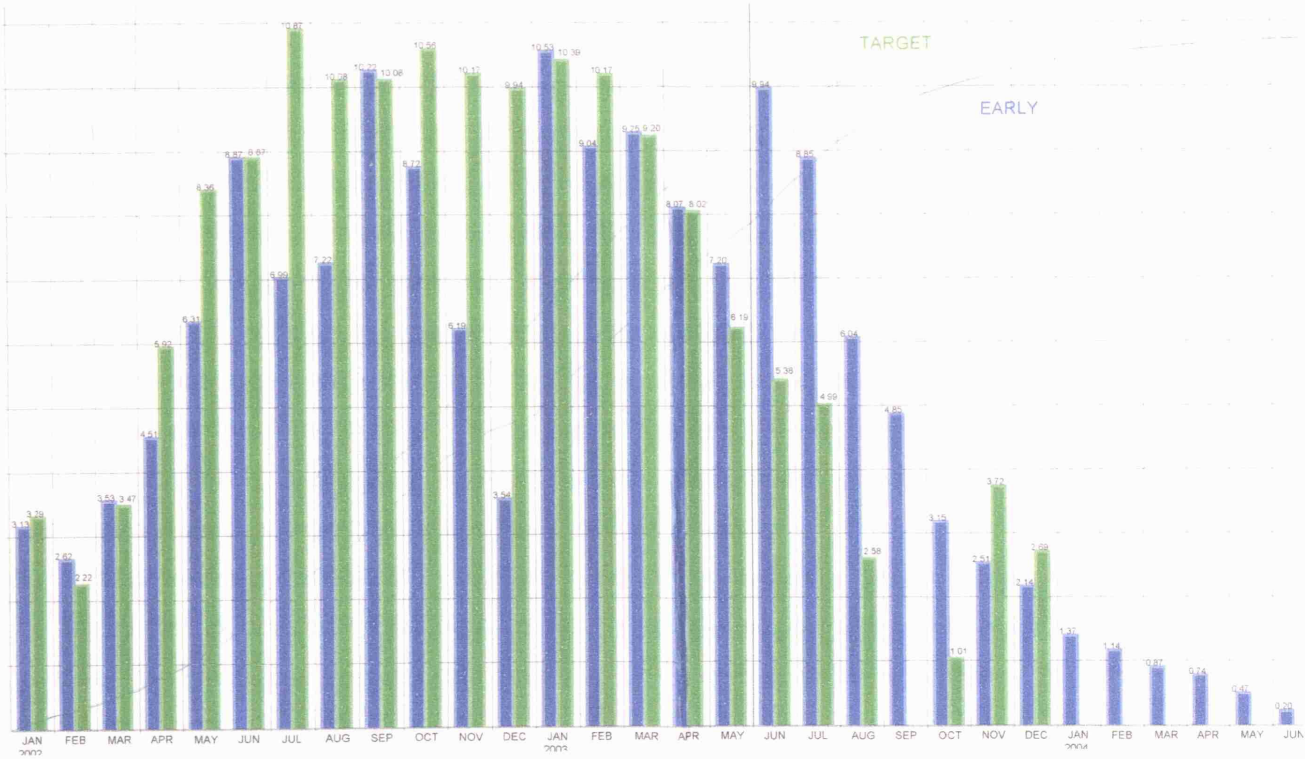

Figure 7.5: Cash flow of the project (Green indicates TARGET while Blue EARLY)
Source: Project Management's database (Primavera)

7.7 Comparing Equestrian centre with the Millennium Dome

The world's biggest dome, the Millennium dome was built in Greenwich to celebrate the new millennium. Although the project in contrast with the Channel Tunnel was on time, on budget and according to plan, it was in no manner successful. Many analysts believe that this was resulting from lack of 'wealthy' management; newspapers critisised the management of the project to

be inadequate. The case was chosen to discuss how management can be vital both in initiation, construction period, but after use as well.

This example is exactly opposite from the Equestrian Centre, but also from Athens 2004 Olympic games as a whole that were extremely successful, but well over budget. [46] Good management was running in many of the Olympic venues and hence costs overrun either didn't exist in some cases or existed because extra work was contracted during the construction phase.

7.8 Olympic Stadium versus Wembley Stadium

As the equestrian centre on its own didn't experience massive overruns in cost and time, it would be more appropriate to contrast *Wembley stadium* with the *Olympic Stadium*, facing some similar situations.

The first experienced problems with its seating facility and the price has risen dramatically in an anyway low bidding contract that many analysts thought that it couldn't be real anyway. The contract is a fixed-price one so the company associated with its construction is about to pay an enormous amount of money, all 'from its pocket'. Because of the type of contract if the company does not run with, it can face penalty clauses. Delays are possible to occur, but not definite as the project is still under construction.

The second one did not face any penal clauses and economical penalties, as the contract was not fixed and on the other hand the government was very anxious to finish the construction on time, so as the venue was ready for the opening ceremony, with millions of spectators around the world; there was a milestone and had to be met no matter what the price would be. This date was met and the opening ceremony turned out to be one of the most spectacular, if not the most spectacular ever to appear in Olympic Games history. The management of the project might not have been in that case the best, but other considerations were affecting it, such as the case that it was in the middle of great traffic and inside Athens, while the equestrian centre was on its own.

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[46] Of course the cost overrun does not apply to the Equestrian centre, but to other projects, such as the Olympic Stadium and the Swimming complex (the plan even changed there, so as the steel roof not to be constructed, but that was a matter of time and not cost).

7.9 Athens 2004 compared with Atlanta 1996 Olympic Games

This comparison was crucial to understand how Athens responded to the Olympics in comparison with another case; Atlanta was chosen as it was one of the best cases to reveal contradictions.

Atlanta 1996 Olympic Games were characterized by many as those to be remembered for the lethal terrorist bombing that took place. Despite that fact, though, there was one of the few Olympics, if not the only one, to have succeeded in the most difficult task, a financial boost and not way over budget. The management of the Olympics must have been so successful that almost everything was on time and within cost; nevertheless, the spectacle was not as good as Athens and many of the venues were demolished a year or so after the end of the Games; this had to do with poor management for post Olympic use of the facilities.

On contrary, Athens 2004 Olympic Games were characterised by Zack Rogue, as the ones that had raised the standard and everybody else should look back in Athens to see what achieved. A relatively small country has achieved the most spectacular Olympic Games of all time up to this point. The historic event came back to its host country; the place it started from and the government was very keen in organizing something that everyone would be talking of. [47] Nevertheless, the milestones were met and the post Olympic management is good enough to sustain the venues at a very good stage, organising at the same time new international events and increasing another sector, tourism in Greece.

[47] From this point of view it succeeded, but of course the cost result was not foreseen and left 'wounds' to the whole Greek nation for the years to come.

CHAPTER 8: Conclusions and Recommendations

8.1 Concluding Remarks

This thesis focused on the Athens 2004 Olympic Games risk and uncertainty issues and particularly on the case study of the Olympic Equestrian centre. The risks associated with Olympic Games are enormous and uncertainty issues could cause a variety of problems to hosting countries. Optimism bias was not visible in a great extent in the particular case study and the management of the project was unique.

Greece faced overrun costs, but not for all its projects. [48] The equestrian centre was an example of delivering the project on time and almost on budget (extra money was claimed because of extra works). Archaeological issues, which caused a great amount of uncertainty on delivering the project for the final milestone, were managed successfully and by effort of the concession the venue was able to host the test events.

It was discussed that other major projects, such as the Channel Tunnel or Millennium Dome faced more problems than the equestrian centre, taking place in countries with much higher economical power and construction experience than Greece. The Greek construction industry has learned its lessons and can deliver now almost any kind of project, giving the correct credibility to risks associated with them. The experience gained is enormous and the only question to be answered in the future is whether Greek community will use it in new 'streams of construction' or not.

Olympics brought sustainability to Athens and created positive externalities not only to the residents surrounding the venues, but also to all Greek community. Tourism has been increased by a high portion as mentioned before and is expected to rise even more in the years to follow. The advertisement that Olympic Games provided for Greece, a relatively small country was enormous and all the Olympic benefits will be visible in the

[48] At the time of the bidding, September 9, 11, 2001 events had not occurred. Hence, the security costs were unexpectedly high for such an economy as Greece.

following years, but mostly in the long-term for the country's economy and popularity.

Table 1: Contextual Framework

	Size of economy (US$GDP per capita)[1]	Economic Status/ Maturity	Political System	Country Risk Score[2]	Real Estate Transparency[3]	City Status	Primary Objectives of Hosting the Olympics
Seoul	$15,733	Fast developing manufacturing based economy.	Young democracy/ previously isolated.	2.37	3	National Capital	National prestige. Opening of economy to outside world.
Barcelona	$18,535	Declining region within EU. Manufacturing based economy.	Spain is a parliamentary monarchy. Regional (Catalonia) political dimension.	1.59	3	Provincial Capital	Regional economic development.
Atlanta	$33,889	Prosperous regional centre with service-based economy.	Federal democratic republic.	1.32	1	Regional hub within South East US	Regional prestige. Economic development.
Sydney	$22,627	Mature but relatively small service-based economy.	Federal democracy.	1.39	1	Commercial centre of Australasia	International positioning. Promote tourism/ convention industry.
Athens	$13,555	Developing economy. Recently admitted to EU.	Parliamentary Republic.	1.89	5	National Capital	Promote tourism/ convention industry. Environmental improvements.

[1] EIU as reported in LaSalle Investment Management – Investment Strategy Annual 2001

[2] World Markets Online - LaSalle Investment Management

[3] LaSalle Investment Management (5 tiers from 1= Transparent to 5 = Opaque)

Figure 8.1: Size, Economic status and Objectives of the last five cities hosting the Olympic Games. Source: Rigas (2003)

Figure 8.1 indicates economic status and main objectives of countries that hosted the Olympics for the last five times. As it can be seen, Greece is by far the country with the lowest Gross Domestic Product (GDP). In that terms the Olympics were a complete success, despite the risks associated with them and the cost overrun. A small country was able to organise one of the most spectacular Olympic Games of all times and it has to get credit for that in the year to follow. The main objectives, which were promoting tourism and improving environment, were achieved; Greece had a rise of 10 per cent in tourism, while Athens has a much higher percentage in 'green' after the Olympics.

The motivation for hosting the Games varies between cities. In the context of mature service-based economies such as Sydney and Atlanta, the focus was on attracting convention business, while for economies like

Barcelona and Athens the centre of attention is the tourist attractiveness. The key on the success of hosting major events, such as the Olympics is largely dependent upon the ability of the city to leverage off the images and perceptions created during the event itself and to continue implementing them in the post-Olympic era.

The Greek community argues that the cost overrun was a disadvantage for the economy that will cause problems in the future, but on the other hand because the Games were such a success the over-costs can be explained in a manner. Another comment is that the Olympic Games brought the entire Hellenic nation together; Greeks worked collaboratively for the achievement of a successful event and now their confidence and pride has risen compared to previous years. Nations all over the world happen to respect Greece more now after everybody witnessed the extreme success and capabilities of this country.

8.2 Future recommendations

It is recommended that all the following Olympic Games give credit to uncertainty and risk as can be vital to organising the Games. This is most important for London 2012, as Benjing 2008 has almost finished all its projects. The risk that China faces now is associated with maintenance costs for the remaining three years before the Olympics. On the other hand, London 2012 has to minimise uncertainty in construction and not follow the Wembley stadium case. Anti-terrorist precautions, which will be extremely high, especially after the attacks of July this year, will add extra risk to the success of the Olympic Games.

After the initial euphoria, some comment on London's success in winning the right to stage the 2012 Olympics turned to focus on the threats, particularly projects being delivered late and/or over budget. Thankfully, the curmudgeons seem to have been seen off, but they will be back and the industry must be armed with the ammunition to see them off again. That means ensuring that the best possible start is made to the design and construction of the infrastructure and arenas on whose success the whole venture depends. The whole country can be said to benefit at least indirectly from the completion of

key infrastructure problems that will be brought forward. [49] Furthermore, the construction of new dwellings for the Olympic requirements could be used to solve the long-term problem that London faces concerning the lack of affordable houses.

The wide political, economical and social implications associated with the hosting of successful Olympic Games, has always been a driving force for all awarded cities. However, this goal should be effectively pursued with the constant remembrance that the action taken should gratify the local inhabitants and future visitors with better living conditions and not contemporary flashes of convenience that will vanish when the spotlight of the Game will be long gone.

Especially for the 2004 Olympic Games, Athens is the second smallest economy to have been awarded the Games in the post-war era (Helsinki, 1952). Therefore the Olympic-induced defects as well as benefits to Athens are expected to affect the whole Greek economy, the property market and the local residents much more than in previous cases (Barcelona, Atlanta and Sydney). This has to be considered significantly when comparing Athens with previous hosts.

Nevertheless, despite of heavy taxation, there are direct and indirect positive impacts of the Olympic Games both in the short-run (tourism) and the long-term (local economy and externalities which are not visible immediately) horizon, which overshadow most of the negative points.

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[49] The chairman of Association for Consultancy and Engineering, Desmond Scott said: "Our industry now rise to the challenge of delivering the challenge of delivering the infrastructure and facilities needed to make the 2012 Olympics the best the world has ever seen".

SUMMARY

The most important parts of the dissertation are briefly summarised below:

- General Information on Athens 2004 Olympic Games.
- Information on the Olympic Equestrian centre.
- The risk associated with Megaprojects mostly in Europe, but around the world as well and how it is dealt.
- Investigation of some significant megaprojecs, such as the Channel Tunnel, the Millennium Dome and the Wembley stadium.
- The Optimism Bias case in project biddings and the study conducted by Mott MacDonald.
- Managing Risk and Uncertainty in projects.
- Post Olympic usage of the Olympic equestrian centre.
- Analysis of the Equestrian centre, by investigating interviews and information on it, but also by comparing it with other projects discussed in previous chapters.
- Athens 2004 Olympic Games in comparison with Atlanta 1996 Olympics.
- Discussion of the full dissertation highlighting points of interest and special outcomes.
- Concluding on benefits that the Olympics had for the Greek community.
- Recommendations on future use of risk and uncertainty issues so as to be avoided in Olympic Games to follow.

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Appendix A

Questionnaire

Questionnaire

Client Issues (who was involved)

- Who was the client? (Athens 2004, government; how many members did it include?)
- Was there agreement of the committee who assigned the project during its construction and what about the specifications? Did those change during the duration or did they remain as initiated in the bid?
- Was the assigning and supervising committee related with the payment? Or the payment was conducted by Athens 2004?

Optimism Bias (Mott MacDonald) (bid optimistically to win)

- Optimistic bidding has been considered to be an issue in big construction projects. Do you believe that generally in Olympic projects such a tendency was present? What about the equestrian centre?
- In what manner were the projects assigned? Was it a combination of price, company's fame or positive development of previous projects that the company undertook?
- Generally in Olympic projects, were there reliable companies preferred (according to previous records) more than others with a lower bidding, but riskier as well?

Megaprojects and Risk (Flyvbjerg) (unexpected situations occur in big projects)

- At the elections of March 2004, the political governing party changed. Did that affect the project progress by any means?
- I assume that bureaucratic issues have appeared. How those have delayed the works and in which stage of the project did they occur? Were those difficulties overcome or all similar issues were avoided as Athens 2004' related projects were a matter of priority?

- Were there problems because many sub-contractors were involved? Did they sub-contract in turn?
- Was there any lack of resources because of high intensity of works in various places around Athens?
- What about archaeological issues? Were delays occurring during the equestrian centre construction?

Project risk management (Chapman&Ward) (risks are always flowing around)

- There is evidence now, that Athens 2004 was very successful, but extremely expensive because of late delivery of individual projects in some cases. Companies or concessions missed contractual milestones, but hit the drop dead date. What would they do differently next time?
- How much of experience gained during the Olympic Games phase is applicable to subsequent projects? Has the Greek industry learned how to manage projects after the Olympic Games?
- More specifically, what are the lessons learned at the time and how do they apply in current running projects?

Wiley Guide, Smith

- According to my opinion, the equestrian centre was a highly specific type of project and experience of such kind was minimal. Where did you get the experts from?
- Was the information flow adequate between companies during the construction phase?
- Was complexity of the funding a factor? If so how did you overcome it?
- Can I have a bar chart indicating the key dates of the construction?
- Were there strict safety issues that on a manner could have delayed the project?
- When exactly did the project finish? (adequate to host the Olympic Games)

Giannis Goumas (Mechanical Engineer) J&P Avax
(ggoumas@jphellas.gr)

Client Issues

1) 2 clients: ODIE (Organisation Conduct Horse Racing of Greece, this is a national body) and Ministry of Culture
The management of the project was hosted by General Secretariat of Sports (as a special service for public works). It conducted the Supervision and administration of the convention.

BUT

ODIE – linked with the New Hippodrome of Athens (a whole project with under this name)
Ministry of Culture – linked with the other part of the project which is named Olympic Equestrian centre.

Both of the parts were constructed as a unite project with the gravity of Olympic Projects. The Olympic equestrian centre had gravity as a clearly Olympic project; the Hippodrome was constructed together with the Olympic project, so it had to keep pace in time with it and on the other hand it had to be transported and settle from Faliro (was the previous host hippodrome) to Markolpoulo as quickly as possible; this was because other Olympic works were hosted in Faliro Complex. Hence, even if it wasn't, the whole equestrian centre was faced as an Olympic project.

At this stage, General Secretariat of Sports is still representing the Ministry of Defense in the project, which is now ready for Post-Olympic use (part of the Olympic real estates at the moment as all other complexes) and for the other part ODIE is still in charge (not General Secretary of Sports any more).
The organization Athens 2004 was just a tenant, it came on August 2003 for the test events and afterwards on May 2004, becoming a resident of the complex until the end of the Paralympics on October 2004. Athens 2004 used the centre, introduced some operation directives (as the normal operation was hosted by the concession), operated the Event (Olympic equestrian games), supervised some works that needed at the time (i.e. some extra wires) with the attribute of being the user and tenant for those months only.

2) Construction works usually in Greece 'suffer' during surveying studies, as they happen to finish at the last moment and are not sufficient; therefore, when the construction stage starts problems appear , which cause alterations (many times we reach large numbers in extra time and money), causing difficulties to the contractor and the client; this is usually one reason why recently clients are no longer also administrator of the convention as before (modern management). An example would be if I am the owner and I want to build a building, there will be an administrative engineering company (consultant) and a contractor. Delays cause problem to all 3 parties, with more appearing for the client (has to pay more money) and the contractor.

Usually, time extensions are given without any penal clauses; the problem is the extra money to be paid.
If the study indicates that you will need 2 windows for a frame, but you can actually see you need 4 when constructing it, the contractor has to be paid the extra 2 windows, which cause difficulty. Such problems existed in the particular project, but not large in proportion with the size of the whole project.
The two basic problems were:

(i) Archaeology
(ii) Alterations ordered from the Olympic committees.

Other than that the conditions were good enough.

3) The entrusting and supervising committee, the General Secretariat of Sports, was in charge for the approval of certifications (payments each month), was paying the part of the project Olympic equestrian centre, but didn't participate in the cash flow of the 'Athens Hippodrome' (ODIE was paying for it). In the beginning GGA was to pay everything, but then ODIE was paying its commitment, from certifications that were approved by GGA.

Optimism Bias

1) The initial value is smaller, as later additional works take place. There is generally such a tendency (all projects turn out to be more costly of the initial budget).

2-3) The offer and entrusting for the project was conducted after grading and the 'Absolute under-bidder law' was not considered for all the Olympic works. Companies which form the biggest in Greek construction sector came forming a concession, after the client's invitation; those concessions competed and examined with the method of grading and not by using the absolute under-bidder. The winner might produce a more expensive bid, but each concession provided different characteristics.
The project was a 'ten-key' one, meaning that the contractor had to do the surveying study, order materials, install the material, everything. The client asked for the 'key in his hand'. The grading happened in each of the concession (3 concessions bid for the particular project) with respect to what they offered at what price and time. Quality mattered a lot for representing a good spectacle and conditions to the outside world; it was a matter of prestige.
All companies/concessions were approved in terms of their previous experience and works, but were graded upon the particular project.

Megaprojects and Risk

1) The elections of March 2004 didn't play any role in the equestrian centre, as the works had already finished by then as well as most of other projects were on their finishing line. There was a change in the governing body, but the tactic was again the same, finishing the works quickly.
Of course, now, in running projects there was some interfering of the new government, accelerated or decelerated some works. Those were the projects

where the new governing party wanted to play a key role (like Marathonos road where the marathon took part). In general terms, though, there were not problems due to political change.

2) Bureaucracy is always a big issue in Greek State. Even the Olympic projects were not able to overcome bureaucracy totally. Generally, there were large improvement steps in the field, but even so comparing Greece with other developed countries of Europe; we are still slow in these matters. Bureaucracy didn't cause massive delays, but this was only because the private concessions were trying hard to overcome bureaucracy and not to lose valuable time. The sad part is that after the Olympics, the 'Bureaucracy monsters' revived back.

3-4) There were 2 basic problems with sub-contractors: (i) there was a great number of them used, because of the extent of the project and (ii) some of them were not of the adequate quality and didn't always keep their word.
The time was minimal and the work to be done massive, hence instead i.e. for 1 sub-contractor for pouring concrete, the concession used 3, one of them was problematic. Too many works around municipality of Attica, so the percentage of non-reliable sub-contractors was high; and also there was a lack of using all sub-contractors that the companies had already worked together with in the past. Some sub-contractors were used, that might have not been used if the situation was different.

5) Fortunately or unfortunately, Archaeology in Greece is of great value. The whole project was constructed over an ancient city, municipality of Merinos, a suburb of Athens dealing with agriculture and trade; it flourished at the same time as Athens, Golden Century of Pericles. They knew that before the works started, but it was decided that the Olympic equestrian centre would be constructed at that place.
When the excavations started, problems began, most of which were not foreseen. There were 4 head archeologists, who needed for a great amount of time, 6-8 months, workforce of about 400 people, in order to be able to reveal and appreciate the findings.
The authorisation was given in an every day basis; you could excavate nowhere, if an archaeologist didn't sign the relative authorisation, unless it was somewhere where excavation took place before. This is valid everywhere in Greece, but here particularly was 10 times as strict, because of the ancient settlement. There were 3 cases when something was found:

(i) The ancient finding was presentable, but without value (in archaeological criteria), which meant that an order was given to demolish it and continue construction.
(ii) The finding was presentable, with some value, so their workers took what they needed and the construction continued.
(iii) The worst case was when the ancient finding was preservable and visible. If the concession had an important part of a building there and archaeologists insisted it should be moved, then design had to be altered something that happened in 2-3 cases.

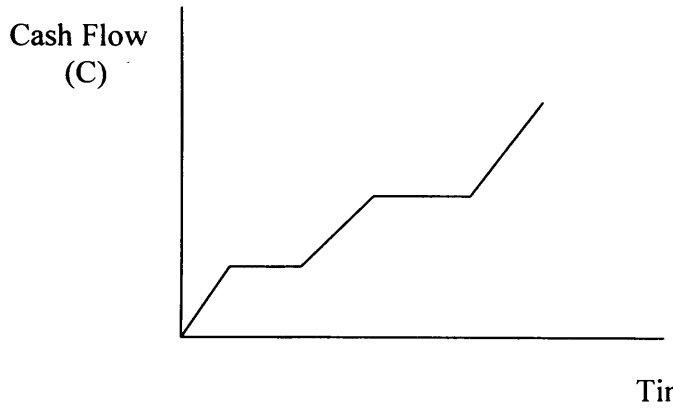
Cases such as (i) and (ii) were taking place every day that caused delays. E.g. the central stables were delayed to start because of a lot of ancients at that part and then acceleration of works was required.

Case (iii) took place twice; although great efforts were made for the design not to alter (movement of the building in the drawing), Archaeology and Ministry of Culture interfered, hence Grand Stand was moved some metres.
Archaeology department delayed and increased the price, as instead of using 30-50 workers, who were believed to be needed in the beginning, 400 were used. Archaeologists were hiring workers; the concession was paying for them and then getting the money from the Ministry of Culture with the suitable certifications.
In order for the final milestone not to be delayed, acceleration of works took place, which meant more money; archaeological findings are national treasure anyway.

Project Risk Management

1) Olympic Games were hosted with enormous success. The convention was signed on 10/1/2001 and for 20 months, but actually the works finished after 18 months. The maintenance cost is really high (grass irrigation, grass cutting, taking care of the arenas).
From one point of view the fact that the construction conventions' allocation were late was a disadvantage, as works were on a rush; but on the other hand an advantage as well, economically, as the works finished 3, 5, 1 month before the venues. If they finished earlier the maintenance cost would be enormous, especially for the particular project, which is a 'living construction' (plants, grass etc). The equestrian centre finished on 2003 and was maintained until 2004.
It is not an absolute fact that the construction was late in all cases, it might be deliberate in some situations (to my opinion some venues were programmed to be late, so that the maintenance cost was lower). The fact that the conventions were signed late was an advantage for the government, as it gave away the projects in lower prices. The equestrian centre has a maintenance cost at the moment and after the Olympics of 500000 euros each month (not including racing condition, but only maintaining buildings, arenas etc) and the concession is in charge of doing so; this is a good income for the companies forming the concession. If the centre had to be combative for racing conditions all the time, the maintenance cost would be increased by 20-30%. The convention indicates that before each major racing event, the equestrian federation has to inform the concession 2 or 1.5 month earlier, in order to prepare the venue for the races.
In August 2003, when test events took place and thereafter the centre was ready for hosting Olympic Games in a 90% percentage; some works have been finalized afterwards as the concession knew they still had a year ahead.

Cash flow was maintained in a good level and this is because works were doing well, hence confirmations of timing succession, hence payments. There was some money left after conventional part, for some out of convention works, which are still examined to be paid. There were new conventions signed for faults (cables, bulbs) after the Olympic Games. A new convention is about to be signed for 500 new stables with duration of works 12-13 months, which concerns the Hippodrome of Athens and forms a good extension.



The graph is an indication of the cash flow in accordance with time of the project during its construction.

The owner of the Olympic equestrian centre is Olympic Real Estates and user the Hellenic Equestrian Federation; they form 2-3 races a year (world championship, Hellenic championship and a local one), the races are 10-20 days long.

2) Olympic Games were a great experience constructively, managerially and with respect to time. Deciding rapidly, pushed by time for important issues gives you a great ability; managers or engineers can be mistaken, but still they gain experience. The experience is here, but I don't know where it can be used now that Greek construction community faces a recession. The country has to open new 'rivers' in order to promote the human force towards new 'horizons'. You can't have in the near future at least, such a huge 'river' (event) as the Olympics, but small channels can be opened towards construction.
PFI which is about to be in value in Greece is a good example, as well as companies can move some construction in East countries. When private companies are involved with construction and maintenance of a project, it has been proved that it works better (like Rio-Antirio Bridge, Attica Road, Spata international airport).
Companies are not faceless; when a project succeeds it is only because of the companies' good personnel force. During Olympic construction, there was a lot of work, but also pressure to the personal life of people. This has as a result, now, that many lost their jobs, these people are wronged as they gave their soul for these Games; they were of course paid, but the personal price is never really paid.

3) Lessons learned: a matter of organisation. If the project succeeds without organisation in only a matter of luck and will happen once or twice. The fact that Greeks finish everything during the last minute is not what should remain from the Olympic Games Organising is extremely important for everything to succeed and this is where the future will depend. There were organised companies that drifted others to success.

Wiley Guide, Smith

The design was conducted by 2-3 large design consultants. The equestrian centre was a special project. The concession needed help, not in the construction critical path, but for the arenas and operation of them. Triathlon for the equestrian centre and hippodrome were special features. The area was just fields and now there is this whole 'city'.
Nobody in Greece knew how to construct a hippodrome. The existing one was built in 1924 by English people at Faliro and until 1967 the president of the hippodrome was an Englishman. Hence, specialist designers came for the main track and cross country (where triathlon took part). The design that Greek consultants made, concerned only the architectural-mechanical-structural-electrical part. The slopes of the tracks, turns etc. were designed by a foreign adviser, who was paid for his service.
There were two advisers that took part in special designs. The one was a French company that deal with hippodromes all over the world and gave indications, e.g. 2% slope in a particular part of the track; after such specifications the construction was not a problem for the concession. The other one was a person that IOC (International Olympic Committee) suggested and he dealt with jumping, dressage and cross country arenas; he used his experience from previous Olympics. Especially the second one was very strict in the specifications he gave and his orders should be followed for the slopes, otherwise there would be the possibility that the track would not be received by Athens 2004 for the games.

2) The Information flow and relationships between the companies forming the concession was positive. This is a point of attention, as usually during concessions, in Greek field but also generally all around the world there are problems between the companies' relationship. The situation was different in the particular project mainly because of the 3 following reasons:
(i) All companies are inside concessions and as a result 'illicit competition' is lost during this period.
(ii) In the particular project, people with advanced management mentality were gathered and this worked only positively.
(iii) The third and most important reason of good flow and relationships was Mr. Fountas, director of the concession and project manager; he managed, due to his character and experience, to bring all the colleagues together with respect to interrelationships. 80% of the project's success is owed to Mr. Fountas and 20% to the good 'construction climate' that was around at that period.

3) Payments were made every month to the concession and were usually on time; the cash flow was in general terms very good for Greek conditions.

4) The safety issues were demanding, not especially because it was an Olympic project, but because the time was minimal and the work massive. Lots of work in little time is always negative for safety. The companies had to safeguard accidents and in general terms this was achieved. There were seminars where possible and the concession has hired and paying lots of money in a safety director.

To my personal opinion, the safety issues could be better; we only reached a percentage of 50-60% of other European companies. I was working in oil refineries before and those are a 'school in safety issues'. As demand was high and time little, we used many foreigners and unskilled workers. Unfortunately, we had 2 fatal accidents (falls), upon 3000 workers for 2 years. Such a situation is very difficult for all of the co-workers, the family and the engineer feels morally responsible (although it is not his fault) for the accident. As a concession we helped the family as much as we could. In the Olympic village the situation was worse, around 10 fatal accidents. Companies that had experience from foreign countries didn't face problems as they were used to strict safety issues.

In no manner were there any claims or sanctions for late delivery.

Thanassis Chountas (Project Manager of the Consortium) J&P Avax (vtzoanos@jphellas.gr) *e-mail: Principle of Economics*

Client Issues

The client issues were a fact, so there was no point asking again after the session was covered from my first interview.

Optimism Bias

1) It is a fact that the financial offers are lower for a number of reasons. One is lack of correct valuation, another is what happened with the Olympic works, which is that because the venue was constructed, something additional needed could be built at the same period; i.e. fire station. This didn't mean that the project was overdue, because new work was added to the initial estimates, which was separately paid of course. Another reason of overdue amounts was archaeological issues; of course archaeology in construction cannot be characterized as unexpected in Greece, but it cannot be exactly estimated. Nevertheless, you cannot add in the initial estimate more because you will never win the project; ancient findings, thunder spoiled a part, those are higher call, hence the price is increased. There are no legal issues (if late, while we have agreed in a particular solution, then yes they could appear). Here it wasn't necessary and as a matter of fact the concession was claiming some extra money that never got.

2-3) The companies that were preferred after marking and competition, were the best and most serious in Greece. The system of absolute under-bidder was not used in the particular case and in the whole of Olympic venues.

Megaprojects and Risk

1) Because the project was already completed, the change in government body did not affect the conduction.

2) The Greek bureaucracy is tough. It is needed sometimes to give some money 'out of the record' so as the works can go on. In the particular project but also in most other venues, the permission for the urban planning was given by the ministers; 2-3 ministers had a meeting and issued the relevant permit so as the works could initiate. If you had to wait in the queue in Markopoulo, the project wouldn't yet have started.

3-4) In the subcontractors' issue, management played a crucial role. 3000 workers with 193 subcontractors was a massive number to manage. The problem was that everyone was involved everywhere; e.g. for concrete we hired Alafogiannis, who was also involved in 2-3 other projects and anxiety was faced. He was well paid, but because of his relationship with other companies he was forced; hence the concession helped him and wherever he was under budget we

he was paid more. All those are management 'weapons' to fulfill your target, finishing the project.

5) Archaeology department was a big problem; great delays were caused, but were eventually covered. With the correct management and some alterations everything was set and finished on time.

Project Risk Management

1) In many projects there were delays and therefore increase in price, so as everything is done quickly. With even better management maybe some of those delays could have eliminated. Time and cost generally is increased. Upon cost, this didn't mean that there was some kind of overshooting (one fraction is upon archaeological issues or because a subcontractor was late, small in many cases). The big cost increase comes from projects that were not included, initially at least in the Olympiad. It is exactly what Zach Rogue was talking about; the fact that you constructed tram, metro (underground) are projects of infrastructure for Greece, not for the Olympic Games. E.g. the current governing body includes the tram in the Olympic Games' budget, in order to prove that the previous government was overshooting; it is a matter of politics after a stage and not construction only, where one body passes responsibilities to the other and vice versa.
Attica road for example was initially a road that could connect Markopoulo with Athens, but this is not the case nowadays; it includes double band, there are no traffic lights at any stage etc. In order for those to be achieved, though, all currents were diverted in Vari; another road was constructed for the residents of the area, as well as bridges etc. All those, obviously were not included in the initial budget, but were additional value added.
Therefore, this massive cost that appears and propagates is not essentially some kind of 'stupidity' or overdue amounts; this was because more construction took part than the initial programme, not in all cases though; i.e. the fire station near the Equestrian centre was included as part of Olympic project. The equestrian centre didn't need a whole station on its own, while Markopoulo area did.

2) After the experience gained from Olympic Games with the enormous projects constructed, most of the Greek companies can construct almost all kind of projects abroad or Greece of course. If for example, a new Hippodrome is to be built in Salonica, it is an easy task now and can be done in less time and with less money. (before the Olympics Greeks didn't have experience of how to build a Hippodrome, while now they do). It can be seen that the experience gained is massive, the question remains whether it will be developed or not; because of minimum construction now in Greece, companies seek countries such as Poland, Bulgaria etc.

3) The lessons are mostly knowledge (many people working here were working abroad for years, as myself, where we experienced and learned what we know and applied it in the situation of Olympics. Experienced Greek engineers were gathered from abroad and companies started forming concessions, more

powerful (from 3-4 smaller, one Construction Group, like AVAX, ETETH, PRAETH). Such a move gives the opportunity to the Group to construct a larger amount of projects, in fields that each smaller company had specialisation; now the Group can construct almost everything. Another fact was that the resources were united, both in workers and machinery, but financially as well.

Wiley Guide, Smith

1) The process is as follows: The state announces how it wants to construct the Hippodrome, particular number of spectators, dressage arena, course of triathlon of particular kilometers and more generally the specifications of the project. A competition follows and each company or usually each concession offers, knowing the specifications to be fixed, the best they can. Each offer has its own peculiarities; the concession sets its surveyors and consultants and they come up with a suggestion. The suggestion which is the favourite of the committee and is following the specifications will win. There has already been consideration and choice of the plan to be followed by each concession.
J&P hired for the hippodrome and arenas planning Deloupe, a French equestrian planner as a consultant/adviser and it was written in the bid that he suggests the following. The concession hired Gregory for the soil and how to construct some particular parts. It is package of how will you construct something, what is it to construct and where have you constructed it before; this is a complete bidding.

2) There was a different model which was followed in the particular project. Usually in concessions (like in Attica road case), the management was associating each company with a part (and was constructed autonomous). In the equestrian centre case all companies were joined; there is a leader, each company of the concession brings in its resources and there were construction managers for each worksite no matter which company. Each company in relation with its percentage ownership was bringing personnel, while the management was common. I was having meetings with the companies' representatives and concluding on the construction programme.
I was doing the management and getting orders from the representatives of each company (Papanikolaou of Sarantopoulos A.E, Antonakos and Kostantinou); we were discussing upon matters and finding solutions so as the project could roll. This model was applied for the first time in a Greek concession and was successful, with a mentality of a large foreign project. The leader or the concession was J&P Avax.

3) There were some delays in payments because of bureaucracy, but not something unusual. The payments were following the way of state (the project was a whole item of a particular amount of money and was not quantity surveyed; €160.000.000. The rest of the projects that was additionally added later were surveyed in order to be paid. There was a programme and break down of works (i.e. the Grand Stand was 10% of the whole project; such percentages were agreed between the companies' representatives). At the end of each month we agreed on the percentage constructed and the payments were split after confirmations.

Initially a plan was made and was useful and an agreement for everything. The confirmations were completed quickly, but if the money delayed a bit; up to 2 months it is legal by law. There were occasions that the payments were late and the concession could ask for an interest, bud didn't so as not to cause dissatisfaction.

4) One of the most important issues when a project is initiated is the safety issues; what I am afraid more are the accidents. Experience was gained from projects abroad, working with foreign companies in construction of the International airport and hence Greeks gained experience and safety issues were stricter. There is a Manual Safety and Health to be used before any project begins, which indicates what should be followed in the field. Most companies do it just to pass the project, but the concessions working for the Olympic projects were too strict upon those matters and indications were followed. There were accidents, but not many (around 20 fatal).

For Greek construction 'community' the experience gained from Olympic Games was very important, especially for Greece, which is a relatively small nation compared with other countries.

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Client Issues

The client issues were a fact, so there was no point asking again after the session was covered from my first interview.

Optimism Bias

1) The project was characterised as 'at cutting off', meaning a specific project with specific money. Excluding this, other works were operated that were extra paid, otherwise the project was something like a 'whole package'. There were much extra construction, always in addition to the original plan, but within limits and therefore no sanctions.

2-3) Three major concessions bid for the winning project. Larger and more reliable companies were of course used, during the entrusting of the Olympic projects in general.

Megaprojects and Risk

1) The change in the government didn't influence the particular project and most of other Olympic projects; all those had a common confrontation and course, so as to be ready for the Olympic Games.

2) The two major problems were bureaucracy and archaeology. In comparison with other non-Olympic construction everything was quicker, but archeologists had their own tempo and didn't care about time.

3-4) There were too many sub-contractors, but as the project was enormous, they preferred to work in it for experience, economical and time purposes. Even though many of them were participating in other projects as well, they tried to hire more people and they didn't usually deny the work offered; especially in Markopoulo equestrian centre, knowing that the project would last longer, hence more economical gain for them.

5) Continuing the argument set in Q.2. For example, when workforce is hired with a contract, it is logical that the most extensive the need is the more they get paid. There were alterations in parking squares, movement of building etc. due to archaeologists. Because the design and construction was done by the same concession it was easier to change some parts. Otherwise the problem with alterations would be much bigger, i.e. if the drawings should be sent in another company and then bring them back or similar issues.

Project Risk Management

1) All Olympic projects were extremely delayed to be auctioned and be given in companies for construction with a result of everything running back and all happening at the last minute. With this clue, it can be seen that it was not a sub-contractors fault; in fact they did their best. If i.e. the roof (of the swimming complex) needs some years to be constructed and government tells you that you only have 1.5 year, it is not the sub-contractor fault. When he is told to do something costing normally X money, but in the half of time, then he will ask 2X; it is obvious.

2) There are a lot of people who gained enormous experience, both engineers and workforce; current projects are few, so Greek companies head towards international markets. The experience is here, but there is lack of work.

3) The particularity of this massive project was the fact that instead of working with one person in charge and all the rest under, it was actually split in many worksites, which helped the project to finish really quickly; such a thing wasn't achieved before. Mr. Fountas was the Project manager, then two people under him, one for technical and one for economical purposes and all the rest were leading the worksites, each independent.
4 building worksites and 2 worksites for surrounding spaces were running. There was common accounts department, but the fact that the project was constructed in parts was only positive and lead towards an earlier finish. Great experience was gained and the leading companies which worked well together. You couldn't notice the people who were part of one company or another, everybody was working together.

Wiley Guide, Smith

1) There was a French company that invited for consulting reasons, but the IOC didn't confirm, hence an adviser was invited from Luxemburg; the two had some kind of contrast, as the French company wanted to get the 'know how', which was actually paid to the adviser and didn't like to take orders from someone else. There are 2-3 advisers that the IOC suggests, a Canadian, one from Luxemburg and another one. The logic here is that if this adviser was used, the athletes trust the track and they are willing to run, otherwise some may stay out.

2) The information flow was extremely well compared with other concessions where there are conflicts between companies.

3) The cash flow had problems during some periods, as General Secretariat of Sports blocked the payments. There was a special service formed within GGA, to supervise the Olympic works and pay for them; very little were owned by PEXODE, such as the Marathon way, which was dealing with pavement engineering and hence more special. July-August 2003 the centre was ready as test events took place, the surrounding spaces were not only ready yet.

4) Upon safety issues, there is no worksite with any problems, but during the last few years there is an intensifying, not with the Olympic projects, but a general one. The hard part is to change the mentality of workers, especially the older ones who learned to work under different aspects.
Athens 2004 caused more entanglement than facilitating the project. All Olympic projects are owned by Olympic real Estates, none is owned by Athens 2004.

The Olympic equestrian centre had the following features (basic information):

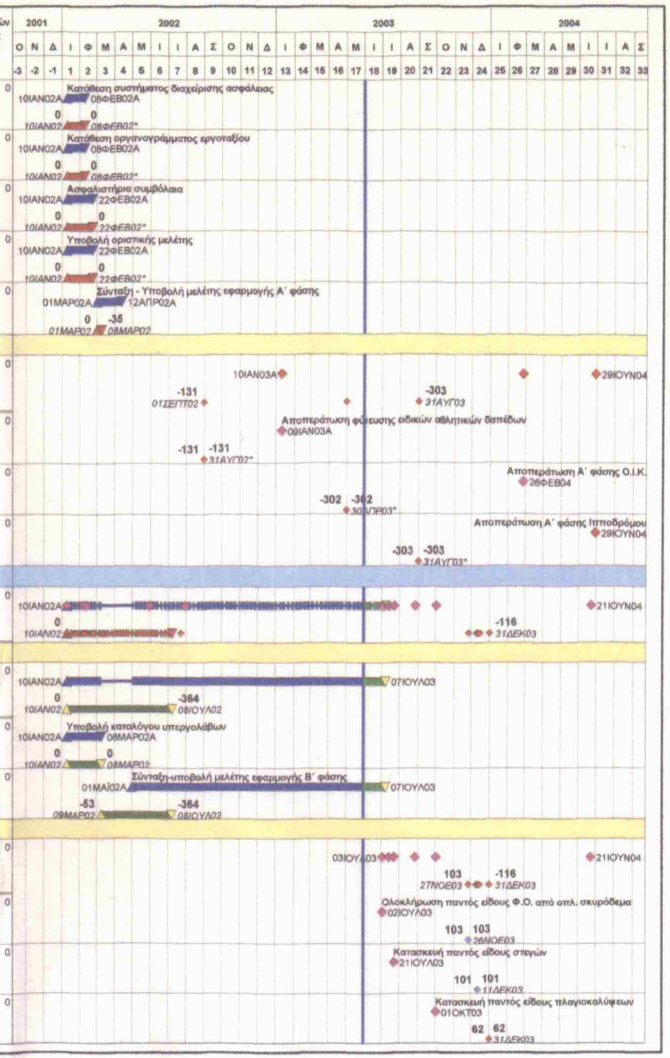
(i) the largest Olympic project
(ii) 214.000.000 million euros cost without VAT
(iii) Facilitated 70000 spectators
(iv) Convention was signed 1
(v) On 10/1/2001
(vi) Covered an area of 2117 acres
(vii) Finished within the 720 days that were agreed
(viii) One of the largest hippodromes globally.

Appendix C

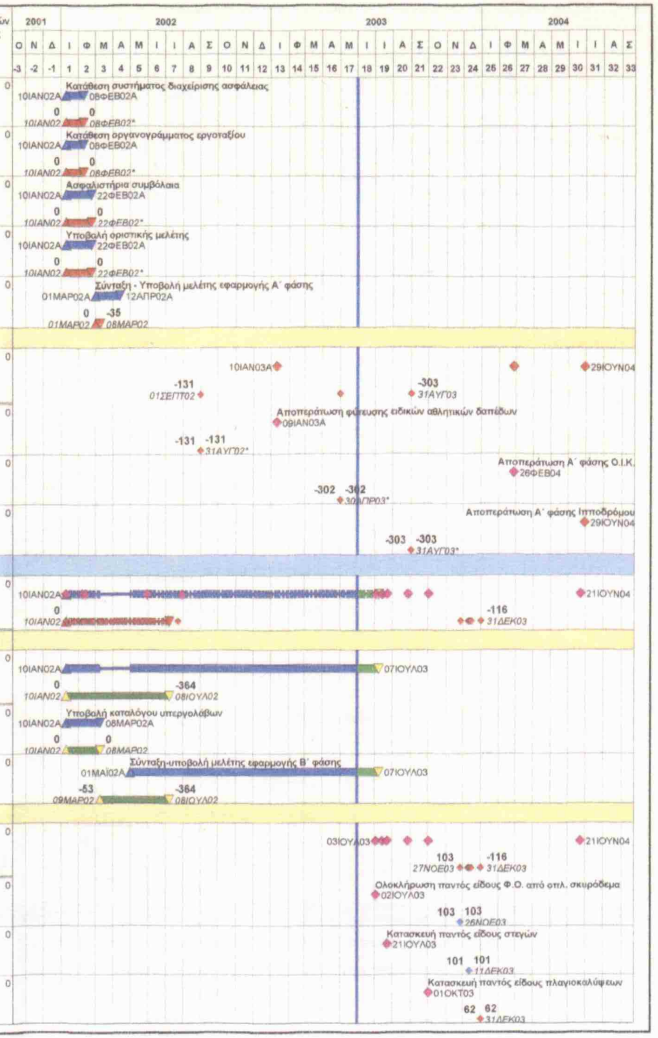
Works Timetable

(Useful Cash flows Diagrams in last pages)

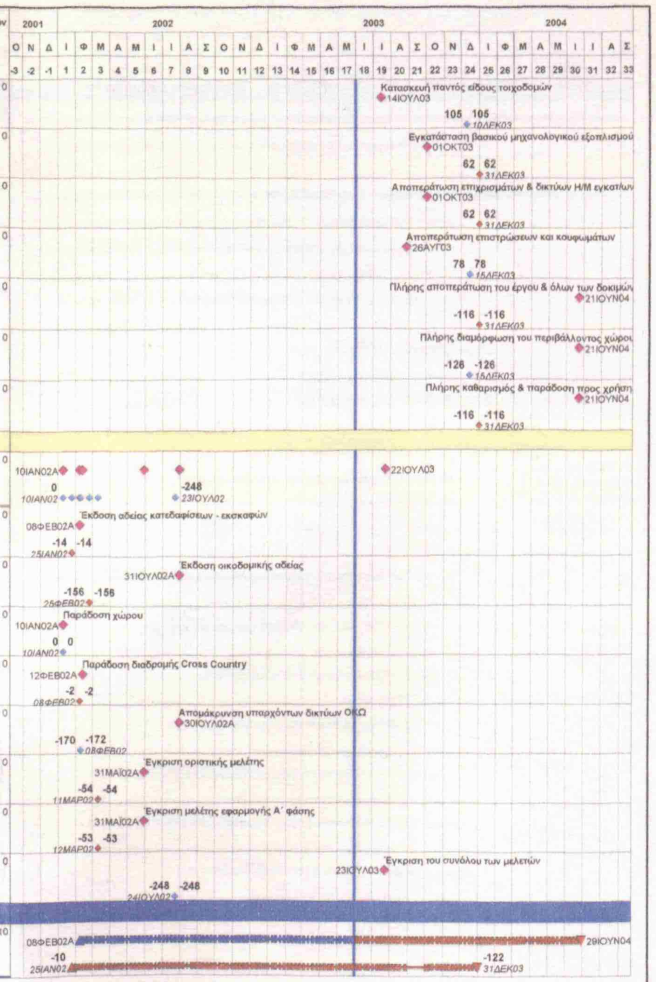
Κωδ. Δραστ.	Αρχ. Διάρκ.	Υπολ. Διάρκεια	% Ποσ.Ολ.	Ενωρίτερη Έναρξη	Ενωρίτερη Λήξη	Ολικό Περιθώριο	Προϋπ/θείσα αξία €	Κερδηθείσα αξία (BCWP, ΠΚΕΕ) €	Αξία προγρ/νων εργασιών (BCWS, ΠΚΠΕ) €	Χρονική Απόκλιση (BCWP - BCWS) €	Ποσοστό Οικονομικής Προόδου %	Αξία εργασιών τρέχουσας περιόδου €
90	30	0	100	10ΙΑΝ02Α	08ΦΕΒ02Α		0	0	0	0	0.00	0
100	30	0	100	10ΙΑΝ02Α	08ΦΕΒ02Α		0	0	0	0	0.00	0
110	44	0	100	10ΙΑΝ02Α	22ΦΕΒ02Α		0	0	0	0	0.00	0
120	44	0	100	10ΙΑΝ02Α	22ΦΕΒ02Α		2,059,510	2,059,510	2,059,510	0	1.30	0
340	8	0	100	01ΜΑΡ02Α	12ΑΠΡ02Α		588,431	588,431	588,431	0	0.37	0
ΠΡΟΘΕΣΜΙΕΣ ΠΕΡΑΤΩΣΗΣ ΕΡΓΑΣΙΩΝ												
Μερικό Άθροισμ	537	124	0	10ΙΑΝ03Α	29ΙΟΥΝ04	0	0	0	0	0	0.00	0
130	0	0	100		09ΙΑΝ03Α		0	0	0	0	0.00	0
140	0	0	0		26ΦΕΒ04	124	0	0	0	0	0.00	0
150	0	0	0		29ΙΟΥΝ04	0	0	0	0	0	0.00	0
ΕΝΔΕΙΚΤΙΚΕΣ ΤΜΗΜΑΤΙΚΕΣ ΠΡΟΘΕΣΜΙΕΣ												
Μερικό Άθροισμ	609	264	79	10ΙΑΝ02Α	21ΙΟΥΝ04	6	588,432	411,902	588,432	-176,530	0.26	0
ΑΠΟΤΥΠΩΣΕΙΣ, ΕΡΕΥΝΕΣ, ΜΕΛΕΤΕΣ, ΑΔΕΙΕΣ												
Μερικό Άθροισμ	544	37	79	10ΙΑΝ02Α	07ΙΟΥΛ03	343	588,432	411,902	588,432	-176,530	0.26	0
160	58	0	100	10ΙΑΝ02Α	08ΜΑΡ02Α		0	0	0	0	0.00	0
170	122	37	70	01ΜΑΪ02Α	07ΙΟΥΛ03	343	588,432	411,902	588,432	-176,530	0.26	0
ΠΡΟΘΕΣΜΙΕΣ ΠΕΡΑΤΩΣΗΣ ΕΡΓΑΣΙΩΝ												
Μερικό Άθροισμ	242	242	0	03ΙΟΥΛ03	21ΙΟΥΝ04	6	0	0	0	0	0.00	0
180	0	0	0		02ΙΟΥΛ03	248	0	0	0	0	0.00	0
190	0	0	0		21ΙΟΥΛ03	235	0	0	0	0	0.00	0
200	0	0	0		01ΟΚΤ03	184	0	0	0	0	0.00	0



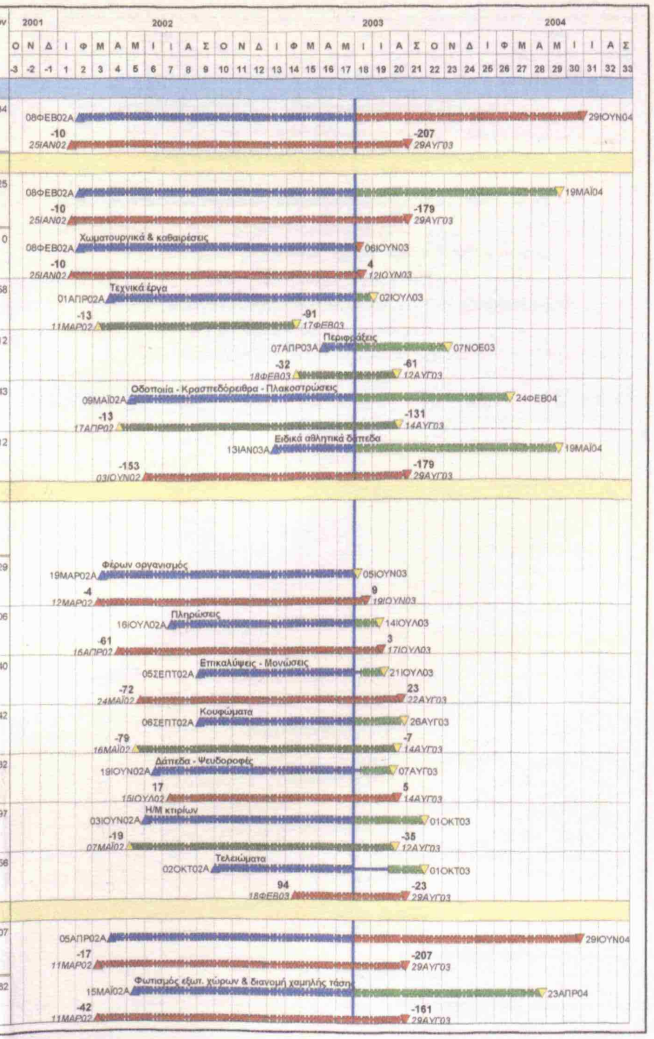
Κωδ. Δραστ.	Αρχ. Διάρκ.	Υπολ. Διάρκεια	% Ποσ.Ολ.	Ενωρίτερη Έναρξη	Ενωρίτερη Λήξη	Ολικό Περιθώριο	Προϋπ/θείσα αξία €	Κερδηθείσα αξία (BCWP, ΠΚΕΕ) €	Αξία προγρ/των εργασιών (BCWS, ΠΚΠΕ) €	Χρονική Απόκλιση (BCWP - BCWS) €	Ποσοστό Οικονομικής Προόδου %	Αξία εργασιών τρέχουσας περιόδου €
90	30	0	100	10ΙΑΝ02Α	08ΦΕΒ02Α		0	0	0	0	0.00	0
100	30	0	100	10ΙΑΝ02Α	08ΦΕΒ02Α		0	0	0	0	0.00	0
110	44	0	100	10ΙΑΝ02Α	22ΦΕΒ02Α		0	0	0	0	0.00	0
120	44	0	100	10ΙΑΝ02Α	22ΦΕΒ02Α		2,059,510	2,059,510	2,059,510	0	1.30	0
340	8	0	100	01ΜΑΡ02Α	12ΑΠΡ02Α		588,431	588,431	588,431	0	0.37	0
ΠΡΟΘΕΣΜΙΕΣ ΠΕΡΑΤΩΣΗΣ ΕΡΓΑΣΙΩΝ												
Μερικό Άθροισμα	537	124	0	10ΙΑΝ03Α	29ΙΟΥΝ04	0	0	0	0	0	0.00	0
130	0	0	100		09ΙΑΝ03Α		0	0	0	0	0.00	0
140	0	0	0		26ΦΕΒ04	124	0	0	0	0	0.00	0
150	0	0	0		29ΙΟΥΝ04	0	0	0	0	0	0.00	0
ΕΝΔΕΙΚΤΙΚΕΣ ΤΜΗΜΑΤΙΚΕΣ ΠΡΟΘΕΣΜΙΕΣ												
Μερικό Άθροισμα	609	264	79	10ΙΑΝ02Α	21ΙΟΥΝ04	6	588,432	411,902	588,432	-176,530	0.26	0
ΑΠΟΤΥΠΩΣΕΙΣ, ΕΡΕΥΝΕΣ, ΜΕΛΕΤΕΣ, ΑΔΕΙΕΣ												
Μερικό Άθροισμα	544	37	79	10ΙΑΝ02Α	07ΙΟΥΛ03	343	588,432	411,902	588,432	-176,530	0.26	0
160	58	0	100	10ΙΑΝ02Α	08ΜΑΡ02Α		0	0	0	0	0.00	0
170	122	37	70	01ΜΑΪ02Α	07ΙΟΥΛ03	343	588,432	411,902	588,432	-176,530	0.26	0
ΠΡΟΘΕΣΜΙΕΣ ΠΕΡΑΤΩΣΗΣ ΕΡΓΑΣΙΩΝ												
Μερικό Άθροισμα	242	242	0	03ΙΟΥΛ03	21ΙΟΥΝ04	6	0	0	0	0	0.00	0
180	0	0	0		02ΙΟΥΛ03	248	0	0	0	0	0.00	0
190	0	0	0		21ΙΟΥΛ03	235	0	0	0	0	0.00	0
200	0	0	0		01ΟΚΤ03	184	0	0	0	0	0.00	0



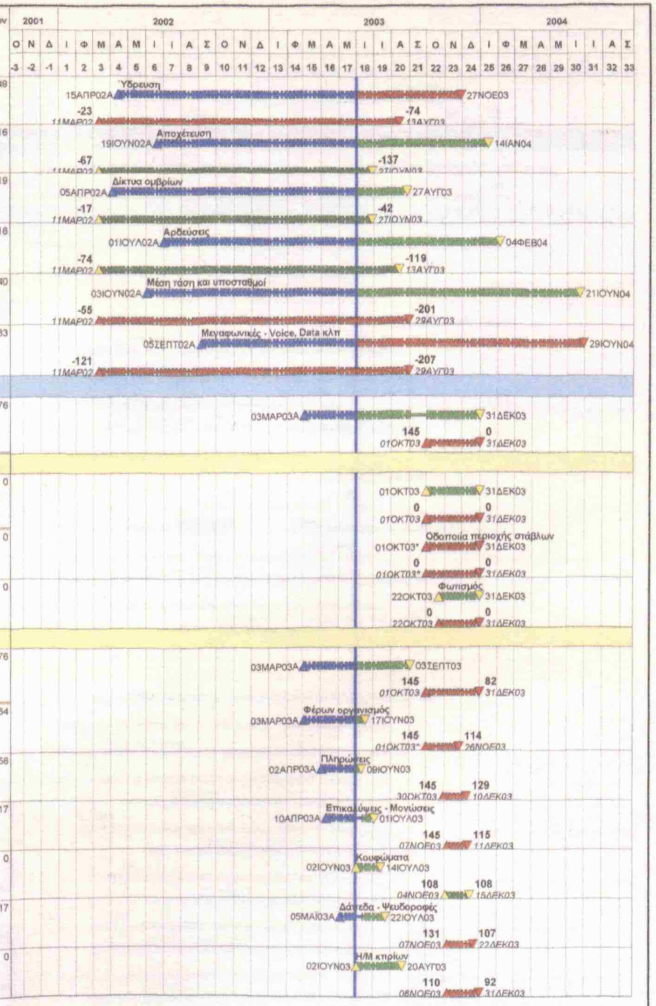
Κωδ. Δραστ.	Αρχ. Διάρκ.	Υπολ. Διάρκεια	% Ποσ.Ολ.	Ενωρίτερη Έναρξη	Ενωρίτερη Λήξη	Ολικό Περιθώριο	Προϋπ/θείσα αξία €	Κερδηθείσα αξία (BCWP, ΠΚΕΕ) €	Αξία προγρ/νων εργασιών (BCWS, ΠΚΠΕ) €	Χρονική Απόκλιση (BCWP - BCWS) €	Ποσοστό Οικονομικής Πρόοδου %	Αξία εργασιών τρέχουσας περιόδου €
205	0	0	0		14ΙΟΥΛ03	240	0	0	0	0	0.00	0
210	0	0	0		01ΟΚΤ03	184	0	0	0	0	0.00	0
220	0	0	0		01ΟΚΤ03	184	0	0	0	0	0.00	0
230	0	0	0		26ΑΥΓ03	210	0	0	0	0	0.00	0
240	0	0	0		21ΙΟΥΝ04	6	0	0	0	0	0.00	0
250	0	0	0		21ΙΟΥΝ04	6	0	0	0	0	0.00	0
260	0	0	0		21ΙΟΥΝ04	6	0	0	0	0	0.00	0
ΕΓΚΡΙΣΕΙΣ - ΠΑΡΟΧΕΣ ΠΡΟΣ ΤΟΝ ΑΝΑΔΟΧΟ												
Μερικό Άθροισμα	381	0	0	10ΙΑΝ02Α	22ΙΟΥΛ03	234	0	0	0	0	0.00	0
270	0	0	100	08ΦΕΒ02Α			0	0	0	0	0.00	0
280	0	0	100	31ΙΟΥΛ02Α			0	0	0	0	0.00	0
290	0	0	100	10ΙΑΝ02Α			0	0	0	0	0.00	0
300	0	0	100	12ΦΕΒ02Α			0	0	0	0	0.00	0
310	0	0	100		30ΙΟΥΛ02Α		0	0	0	0	0.00	0
315	0	0	100	31ΜΑΪ02Α			0	0	0	0	0.00	0
335	0	0	100	31ΜΑΪ02Α			0	0	0	0	0.00	0
345	0	0	0	23ΙΟΥΛ03		234	0	0	0	0	0.00	0
ΙΠΠΟΔΡΟΜΟΣ												
Μερικό Άθροισμα	594	270	61	08ΦΕΒ02Α	29ΙΟΥΝ04	0	96,063,009	65,561,511	76,008,286	-10,446,775	41.46	4,718,810



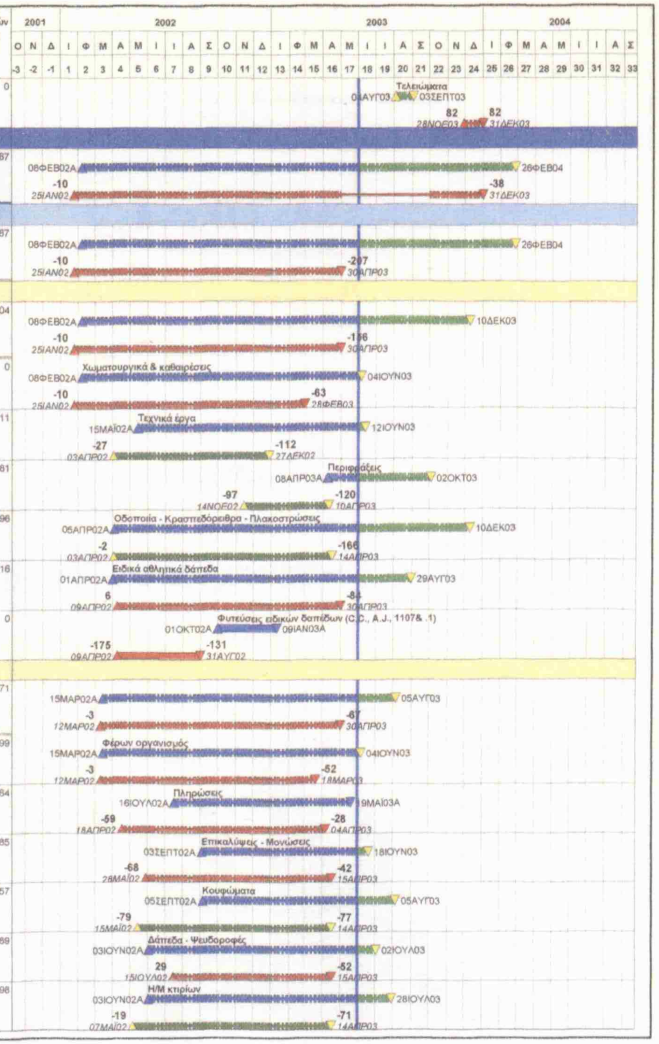
Κωδ. Δραστ.	Αρχ. Διάρκ.	Υπολ. Διάρκεια	% Ποσ.Ολ.	Ενωρίτερη Έναρξη	Ενωρίτερη Λήξη	Ολικό Περιθώριο	Προϋπ/θείσα αξία €	Κερδηθείσα αξία (BCWP, ΠΚΕΕ) €	Αξία προγρ/νων εργασιών (BCWS, ΠΚΠΕ) €	Χρονική Απόκλιση (BCWP - BCWS) €	Ποσοστό Οικονομικής Πρόοδου %	Αξία εργασιών τρέχουσας περιόδου €
ΙΠΠΟΔΡΟΜΟΣ Α΄ ΦΑΣΗ												
Μερικό Άθροισμα	594	270	63	08ΦΕΒ02Α	29ΙΟΥΝ04	0	88,960,705	63,508,407	76,008,286	-12,499,879	40.15	3,813,334
ΠΕΡΙΒΑΛΛΩΝ ΧΩΡΟΣ												
Μερικό Άθροισμ	586	242	58	08ΦΕΒ02Α	19ΜΑΪ04	28	18,380,572	9,499,293	15,590,373	-6,091,080	6.01	753,225
320	343	5	99	08ΦΕΒ02Α	06ΙΟΥΝ03	0	5,204,138	5,126,076	5,067,586	58,490	3.24	0
325	234	22	91	01ΑΠΡ02Α	02ΙΟΥΛ03	86	917,447	830,290	917,447	-87,157	0.53	87,158
330	120	112	7	07ΑΠΡ03Α	07ΝΟΕ03	158	1,892,531	113,400	973,205	-859,805	0.07	88,012
350	331	184	44	09ΜΑΪ02Α	24ΦΕΒ04	88	4,856,141	2,156,127	4,078,572	-1,922,445	1.36	349,843
360	311	242	22	13ΙΑΝ03Α	19ΜΑΪ04	28	5,710,315	1,273,400	4,553,563	-3,280,163	0.81	228,412
ΚΤΙΡΙΑΚΑ												
Μερικό Άθροισμ												
370	315	4	99	19ΜΑΡ02Α	05ΙΟΥΝ03	184	15,390,962	15,175,489	14,755,779	419,710	9.60	292,429
380	312	30	91	16ΙΟΥΛ02Α	14ΙΟΥΛ03	184	4,697,960	4,251,854	4,201,060	50,594	2.69	446,306
390	312	26	92	05ΣΕΠΤ02Α	21ΙΟΥΛ03	217	3,669,787	3,365,195	2,987,583	377,612	2.13	7,340
400	313	60	81	06ΣΕΠΤ02Α	26ΑΥΓ03	210	7,039,032	5,694,577	5,847,119	-152,542	3.60	422,342
410	272	39	86	19ΙΟΥΝ02Α	07ΑΥΓ03	217	3,838,151	3,121,534	2,929,247	192,287	1.97	174,632
420	318	86	73	03ΙΟΥΝ02Α	01ΟΚΤ03	184	19,804,197	14,476,868	16,628,052	-2,151,184	9.15	930,797
430	132	44	67	02ΟΚΤ02Α	01ΟΚΤ03	184	2,657,432	1,772,507	1,389,112	383,395	1.12	252,456
ΔΙΚΤΥΑ												
Μερικό Άθροισμ	556	270	48	05ΑΠΡ02Α	29ΙΟΥΝ04	0	13,682,612	6,151,290	11,679,961	-5,528,671	3.88	333,807
440	366	224	39	15ΜΑΪ02Α	23ΑΠΡ04	46	3,838,151	1,411,803	3,011,912	-1,600,309	0.89	36,382



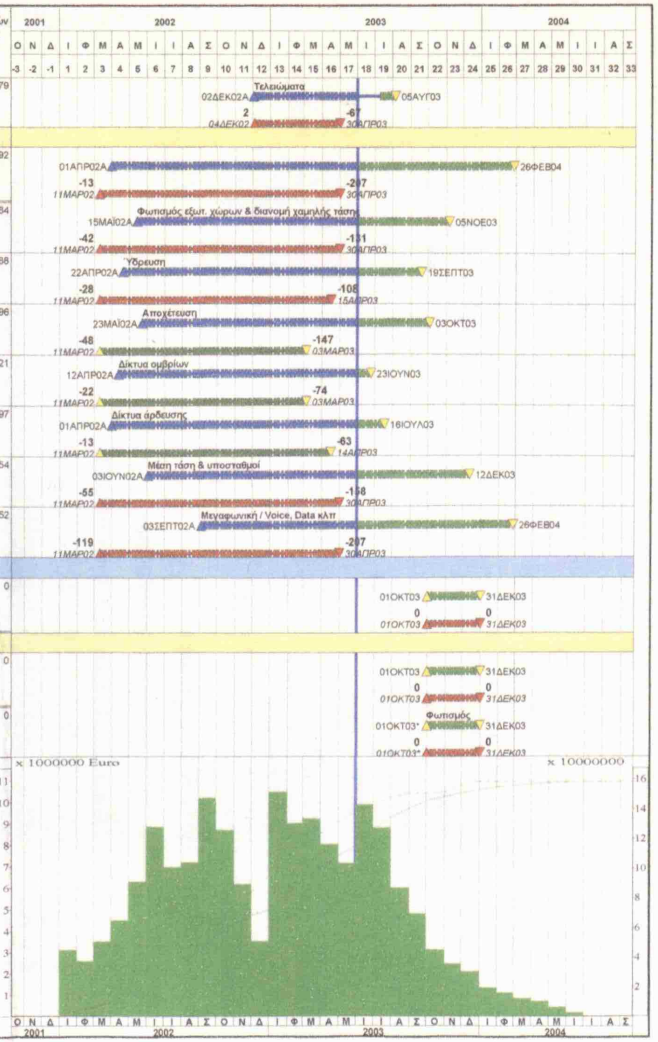
Κωδ. Δραστ.	Αρχ. Διάρκ.	Υπολ. Διάρκεια	% Ποσ.Ολ.	Ενωρίτερη Εναρξη	Ενωρίτερη Λήξη	Ολικό Περιθώριο	Προϋπ/θείσα αξία €	Κερδηθείσα αξία (BCWP, ΠΚΕΕ) €	Αξία προγρ/νων εργασιών (BCWS, ΠΚΠΕ) €	Χρονική Απόκλιση (BCWP - BCWS) €	Ποσοστό Οικονομικής Προόδου %	Αξία εργασιών τρέχουσας περιόδου €
450	355	126	65	15ΑΠΡ02Α	27ΝΟΕ03	0	1,534,351	989,656	1,309,601	-319,945	0.63	24,549
460	322	156	52	19ΙΟΥΝ02Α	14ΙΑΝ04	99	1,028,173	529,509	967,504	-437,995	0.33	69,916
470	322	61	81	05ΑΠΡ02Α	27ΑΥΓ03	99	1,281,262	1,037,822	1,205,660	-167,838	0.66	39,719
480	355	171	52	01ΙΟΥΛ02Α	04ΦΕΒ04	99	2,024,710	1,050,824	1,728,133	-677,309	0.66	42,518
490	366	264	28	03ΙΟΥΝ02Α	21ΙΟΥΝ04	6	2,467,616	865,997	2,042,862	-1,356,865	0.43	103,640
500	366	270	26	05ΣΕΠΤ02Α	29ΙΟΥΝ04	0	1,708,349	445,879	1,414,289	-968,410	0.28	17,083
ΙΠΠΟΔΡΟΜΟΣ Β' ΦΑΣΗ												
Μερικό Αθροισμα	208	148	21	03ΜΑΡ03Α	31ΔΕΚ03	122	7,102,304	2,053,104	0	2,053,104	1.31	1,105,476
ΠΕΡΙΒΑΛΛΩΝ ΧΩΡΟΣ												
Μερικό Αθροισμα	63	63	0	01ΟΚΤ03	31ΔΕΚ03	122	949,083	0	0	0	0.00	0
510	63	63	0	01ΟΚΤ03*	31ΔΕΚ03	0	537,814	0	0	0	0.00	0
520	48	48	0	22ΟΚΤ03	31ΔΕΚ03	122	411,269	0	0	0	0.00	0
ΚΤΙΡΙΑΚΑ												
Μερικό Αθροισμα	126	66	30	03ΜΑΡ03Α	03ΣΕΠΤ03	204	6,153,221	2,053,104	0	2,053,104	1.31	1,105,476
530	40	11	72	03ΜΑΡ03Α	17ΙΟΥΝ03	204	1,075,627	769,073	0	769,073	0.49	102,184
540	30	6	81	02ΑΠΡ03Α	09ΙΟΥΝ03	204	933,265	755,945	0	755,945	0.48	576,758
550	25	12	53	10ΑΠΡ03Α	01ΙΟΥΛ03	234	949,083	498,269	0	498,269	0.32	396,717
560	30	30	0	02ΙΟΥΝ03	14ΙΟΥΛ03	240	1,123,061	0	0	0	0.00	0
570	32	27	15	05ΜΑΪ03Α	22ΙΟΥΛ03	234	205,635	29,817	0	29,817	0.02	29,817
580	56	56	0	02ΙΟΥΝ03	20ΑΥΓ03	204	1,645,077	0	0	0	0.00	0



Κωδ. Δραστ.	Αρχ. Διάρκ.	Υπολ. Διάρκεια	% Ποσ.Ολ.	Ενωρίτερη Έναρξη	Ενωρίτερη Λήξη	Ολικό Περιθώριο	Προϋπ/θεία σα αξία €	Κερδηθείσα αξία (BCWP, ΠΚΕΕ) €	Αξία πραγμ/νων εργασιών (BCWS, ΠΚΠΕ) €	Χρονική Απόκλιση (BCWP - BCWS) €	Ποσοστό Οικονομικής Προόδου %	Αξία εργασιών τρέχουσας περιόδου €
590	22	22	0	04ΑΥΓ03	03ΣΕΠ03	204	221,453	0	0	0	0.00	0
ΟΛΥΜΠΙΑΚΟ ΙΠΠΙΚΟ ΚΕΝΤΡΟ												
Μερικό Αθροισμα	510	186	75	08ΦΕΒ02Α	26ΦΕΒ04	84	56,233,161	44,641,349	55,916,800	-11,275,451	28.23	2,476,567
ΟΛΥΜΠΙΑΚΟ ΙΠΠΙΚΟ ΚΕΝΤΡΟ Α΄ ΦΑΣΗ												
Μερικό Αθροισμα	510	186	76	08ΦΕΒ02Α	26ΦΕΒ04	84	55,916,800	44,641,349	55,916,800	-11,275,451	28.23	2,476,567
ΠΕΡΙΒΑΛΛΩΝ ΧΩΡΟΣ												
Μερικό Αθροισμ	459	135	76	08ΦΕΒ02Α	10ΔΕΚ03	135	17,795,304	12,664,072	17,795,304	-5,131,232	8.01	405,004
600	274	3	99	08ΦΕΒ02Α	04ΙΟΥΝ03	84	4,682,142	4,635,321	4,682,142	-46,821	2.93	0
605	185	9	95	15ΜΑΪ02Α	12ΙΟΥΝ03	135	695,994	662,586	695,994	-33,408	0.42	32,711
610	100	87	13	08ΑΠΡ03Α	02ΟΚΤ03	183	790,902	99,654	790,902	-691,248	0.06	79,881
630	257	135	48	05ΑΠΡ02Α	10ΔΕΚ03	135	5,504,681	2,620,228	5,504,681	-2,884,453	1.66	231,196
640	263	63	76	01ΑΠΡ02Α	29ΑΥΓ03	207	6,121,585	4,646,283	6,121,585	-1,475,302	2.94	61,216
645	145	0	100	01ΟΚΤ02Α	09ΙΑΝ03Α		0	0	0	0	0.00	0
ΚΤΙΡΙΑΚΑ												
Μερικό Αθροισμ	345	46	90	15ΜΑΡ02Α	05ΑΥΓ03	224	27,729,038	25,276,735	27,729,038	-2,452,303	15.98	1,362,671
650	253	3	99	15ΜΑΡ02Α	04ΙΟΥΝ03	224	10,977,726	10,845,993	10,977,726	-131,733	6.86	98,799
660	240	0	100	16ΙΟΥΛ02Α	19ΜΑΪ03Α		2,072,164	2,072,164	2,072,164	0	1.31	99,464
670	222	12	95	03ΣΕΠ02Α	18ΙΟΥΝ03	248	1,439,442	1,361,712	1,439,442	-77,730	0.86	90,685
680	230	46	80	05ΣΕΠ02Α	05ΑΥΓ03	224	2,056,348	1,640,964	2,056,346	-415,382	1.04	264,057
690	189	22	89	03ΙΟΥΝ02Α	02ΙΟΥΛ03	248	1,376,170	1,219,287	1,376,170	-156,883	0.77	104,589
700	236	40	83	03ΙΟΥΝ02Α	28ΙΟΥΛ03	230	8,763,199	7,290,982	8,763,199	-1,472,217	4.61	595,898



Κωδ. Δραστ.	Αρχ. Διάρκ.	Υπολ. Διάρκεια	% Ποσ.Ολ.	Ενωρίτερη Έναρξη	Ενωρίτερη Λήξη	Ολικό Περιθώριο	Προϋπ/θεισα αξία €	Κερδηθείσα αξία (BCWP, ΠΚΕΕ) €	Αξία προγρ/νων εργασιών (BCWS, ΠΚΠΕ) €	Χρονική Απόκλιση (BCWP - BCWS) €	Ποσοστό Οικονομικής Προόδου %	Αξία εργασιών τρέχουσας περιόδου €
710	98	19	81	02ΔΕΚ02Α	05ΑΥΓ03	224	1,043,991	845,633	1,043,991	-198,358	0.53	99,179
ΔΙΚΤΥΑ												
Μερικό Αθροισμα	476	186	66	01ΑΠΡ02Α	26ΦΕΒ04	84	10,392,458	6,700,542	10,392,458	-3,691,916	4.24	688,892
720	282	110	61	15ΜΑΪ02Α	05ΝΟΕ03	160	2,720,704	1,659,629	2,720,704	-1,061,075	1.05	326,484
730	273	78	72	22ΑΠΡ02Α	19ΣΕΠΤ03	84	1,860,895	1,187,540	1,860,895	-473,355	0.75	51,488
740	244	88	64	23ΜΑΪ02Α	03ΟΚΤ03	182	632,722	405,575	632,722	-227,147	0.26	73,396
750	244	15	94	12ΑΠΡ02Α	23ΙΟΥΝ03	238	822,539	770,719	822,539	-51,820	0.49	26,321
760	272	32	88	01ΑΠΡ02Α	16ΙΟΥΛ03	238	1,866,530	1,650,013	1,866,530	-216,517	1.04	44,797
770	282	137	52	03ΙΟΥΝ02Α	12ΔΕΚ03	133	632,722	325,852	632,722	-306,870	0.21	117,054
780	282	186	34	03ΣΕΠΤ02Α	26ΦΕΒ04	84	2,056,346	701,214	2,056,346	-1,355,132	0.44	49,352
ΟΛΥΜΠΙΑΚΟ ΙΠΠΙΚΟ ΚΕΝΤΡΟ Β΄ ΦΑΣΗ												
Μερικό Αθροισμα	63	63	0	01ΟΚΤ03	31ΔΕΚ03	122	316,361	0	0	0	0.00	0
ΠΕΡΙΒΑΛΛΩΝ ΧΩΡΟΣ												
Μερικό Αθροισμα	63	63	0	01ΟΚΤ03	31ΔΕΚ03	122	316,361	0	0	0	0.00	0
790	63	63	0	01ΟΚΤ03*	31ΔΕΚ03	122	316,361	0	0	0	0.00	0



Λεζάντα Γραφήματος Πόρου/Κόστους

Πόρος ΚΑΤ

Συνολική χρήση σε ενωρίτερες ημερ. ανά μήνα (Τρέχουσα Εκτίμηση)

Καμπύλη τρέχουσας εκτίμησης

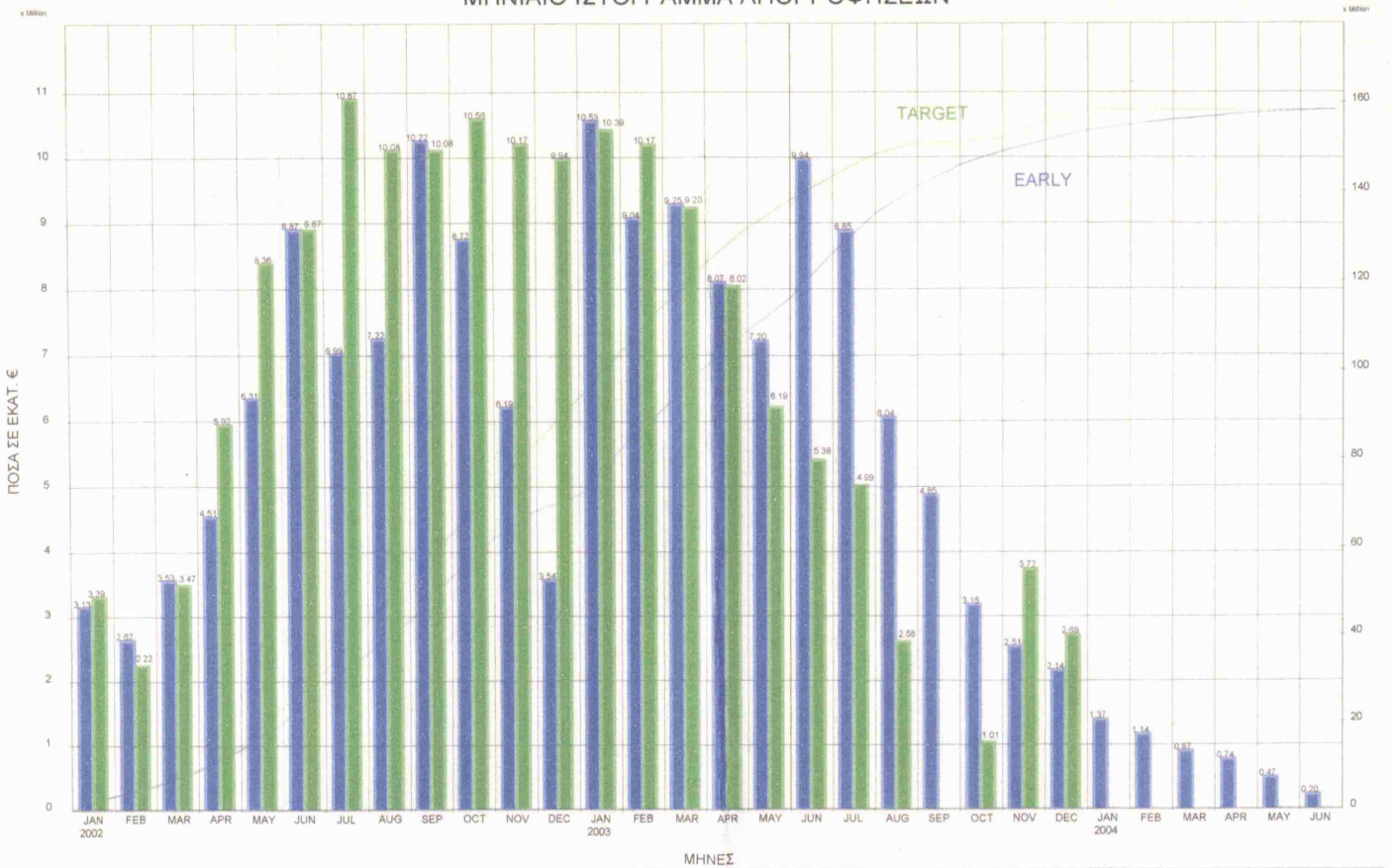
Καμπύλη δεδουλευμένης αξίας

Καμπύλη προϋπολογισμού

Λεπτομερειακή κλίμακα (αριστερά) X 1000000Euro

Αθροιστική κλίμακα (δεξιά) X 19674685826Euro

ΜΗΝΙΑΙΟ ΙΣΤΟΓΡΑΜΜΑ ΑΠΟΡΡΟΦΗΣΕΩΝ



Project Start	10JAN02	Schedule dates	TS33	ΕΤΕΘ-J&P,ΑΒΑΞ-ΤΕΡΝΑ-ΠΑΝΤΕΧΝΙΚΗ	Sheet 1 of 1
Project Finish	29JUN04	Target 1 dates as of 10JAN02		ΙΠΠΟΔΡΟΜΟΣ & ΟΛΥΜΠΙΑΚΟ ΙΠΠΙΚΟ ΚΕΝΤΡΟ	
Data Date	1JUN03			16η ΕΝΗΜΕΡΩΣΗ ΧΡΟΝΟΔΙΑΓΡΑΜΜΑΤΟΣ	
Plot Date	10JUN03				

ΣΥΝΤΑΞΑΣ: ΓΡ. ΜΟΥΖΑΚΙΤΗΣ ΠΟΛ.ΜΗΧ. MSc

Date	Revision	Checked	Approved

Appendix D

Markopoulo Olympic Equestrian Centre

Information

OLYMPIC EQUESTRIAN CENTRE AND THE NEW ATHENS RACECOURSE

The project consists of the design and construction of the Olympic Equestrian Centre and the new Athens Racecourse. The works take place on a site of 2117 acres east of the town of Marcopoulo Attica, on the site where Myrinounda used to be 5000 years ago. The complex consists of:

A. The Olympic Equestrian Centre, which includes:

- A Dressage Arena , with a seating capacity for 8.168 spectators. Bleachers for 2.040 spectators are fixed, while the remaining 6.128 are demountable. Footing is sand.
- A Jumping arena, with a seating capacity for 15.076 spectators. Bleachers for 6.010 spectators are fixed, while the remaining 9.066 are demountable. Footing is grass.
- A Dressage Warm-up Arena , 60 * 20 m. Footing is sand.
- A Jumping Warm-up Arena , 40 * 80 m. Footing is grass.
- A Jumping Training Arena , 90 * 90 m. Footing is grass.
- Two (2) Outdoor Jumping and Dressage Training Arenas , 90 * 45 m. each. Footing is sand.
- Three (3) Outdoor Dressage Training Arenas , 80 * 30 m. each. Footing is sand.
- A Circular Dressage Training Arena , 40 m. diam. Footing is sand.
- An Indoor arena, with a seating capacity for 1.012 spectators.
- Stables for the Olympic Equestrian Centre, for 280 horses.
- Feed Warehouse and Guard's facilities.
- Cross-country Course
- Organizing Committeee and VIP Building
- Entrance building for the Olympic Equestrian Centre.
- Box Office
- Small Clinic

B. The Racecourse Complex includes:

- Main and Training Race - Track
- Racecourse Entrance Building
- Saddle Boxes
- Grandstand
- Maintenance Building
- Two Complexes of Racecourse Stables for 1.610 horses
- Veterinarian Clinic and Recovery Boxes – Equestrian Centre Doping Control
- Farrier's Workshop
- Saddler's Workshop
- Food Store

- Storage Buildings
- Guard's facilities.
- Treatment Plant

C. Parking for 4.000 cars

Main Design Principles

The Design of the Complex has been based on the following principles:

- Fulfilment of all requirements for spaces and functions as set within the building program.
- Exhibiting the archaeological findings for appreciation of the visitors.
- Layout and formation of the volumes of the various buildings in such a way so as to give the impression of belonging to the complex, despite their being part of different groups.

Construction of the Project

The Invitation to Tender for the whole Project has been issued by the General Secretariat for Sports in the " Lump Sum Design and Construction" system. The Contractual Lump Sum amounts to 181.029.082 Euros, plus VAT. The project is currently under construction by the Joint Venture "ETETH S.A. – J & P (HELLAS) S.A. – GEK S.A. – C.I.SARANDOPOULOS S.A."

Post - Olympic Use

The Olympic Equestrian Centre as well as the Racecourse shall constitute a modern multi-functional sports center not only for the Olympic Games but also as a World Standard Venue for International Events for the years to follow.

Project Data - Schedule

Project Cost	181.029.082 Euros
No of spectators	70.000
Total building space	105.000 m2 (spaces above ground level)
Date of Contract	10-1-2002
Construction Time	720 days
Contractor	"ETETH S.A. – J & P (HELLAS) S.A. – GEK S.A. – C.I.SARANDOPOULOS S.A."
Supervision	General Secretariat for Sports – Special Service for Public works and Olympic Sports Projects and installations

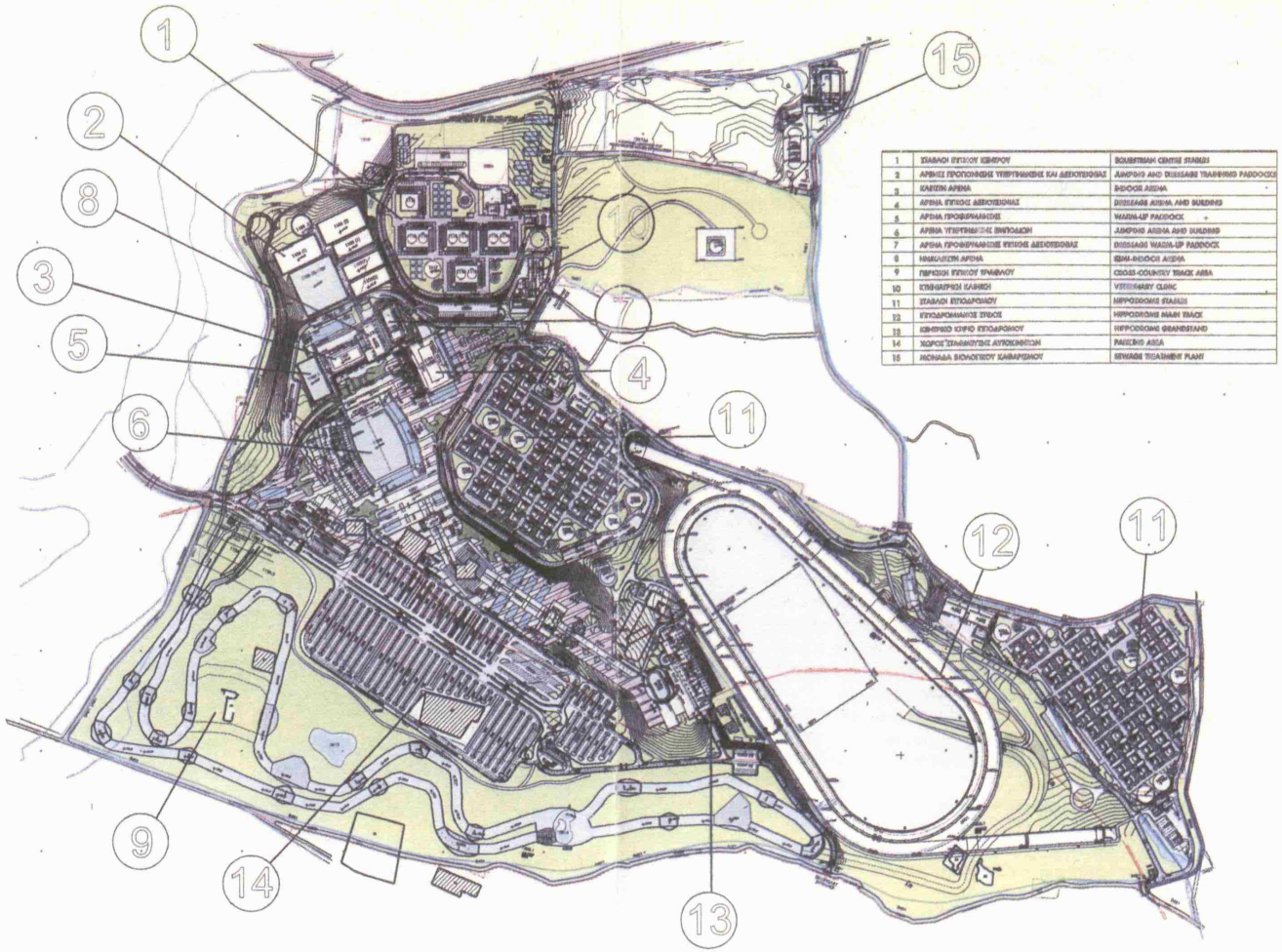
Appendix E

Equestrian Centre

Plans and Figures

ΟΛΥΜΠΙΑΚΟ ΙΠΠΙΚΟ ΚΕΝΤΡΟ & ΝΕΟΣ ΙΠΠΟΔΡΟΜΟΣ ΑΘΗΝΩΝ

Κ/ΞΙΑ ΕΤΕΘ Α.Ε. - J&P - ΑΒΑΞ Α.Ε. - ΤΕΡΝΑ Α.Ε. - ΠΑΝΤΕΧΝΙΚΗ Α.Ε.



1	ΣΤΑΒΛΟΙ ΙΠΠΙΚΟΥ ΚΕΝΤΡΟΥ	EQUESTRIAN CENTRE STABLES
2	ΑΡΕΝΕΣ ΠΡΟΠΟΝΗΣΗΣ ΥΠΕΡΠΗΔΗΣΗΣ ΚΑΙ ΔΙΕΚΠΤΩΣΕΩΣ	JUMPING AND DRESSAGE TRAINING PADDOCKS
3	ΚΑΛΥΠΤΗ ΑΡΕΝΑ	INDOOR ARENA
4	ΑΡΕΝΑ ΙΠΠΙΚΗΣ ΔΙΕΚΠΤΩΣΕΩΣ	DRESSAGE ARENA AND BUILDING
5	ΑΡΕΝΑ ΠΡΟΘΕΡΜΑΝΣΗΣ	WARM-UP PADDOCK
6	ΑΡΕΝΑ ΥΠΕΡΠΗΔΗΣΗΣ ΒΑΘΡΟΔΩΝ	JUMPING ARENA AND BUILDING
7	ΑΡΕΝΑ ΠΡΟΘΕΡΜΑΝΣΗΣ ΙΠΠΙΚΗΣ ΔΙΕΚΠΤΩΣΕΩΣ	DRESSAGE WARM-UP PADDOCK
8	ΗΜΙΚΑΛΥΠΤΗ ΑΡΕΝΑ	SEMI-INDOOR ARENA
9	ΠΕΡΙΟΧΗ ΙΠΠΙΚΟΥ ΤΡΑΘΛΟΥ	CROSS-COUNTRY TRACK AREA
10	ΚΤΗΝΙΑΤΡΙΚΗ ΚΛΙΝΙΚΗ	VETERINARY CLINIC
11	ΣΤΑΒΛΟΙ ΙΠΠΟΔΡΟΜΟΥ	HIPPODROME STABLES
12	ΙΠΠΟΔΡΟΜΙΚΟΣ ΤΡΟΧΟΣ	HIPPODROME MAIN TRACK
13	ΚΕΝΤΡΙΚΟ ΚΤΙΡΙΟ ΙΠΠΟΔΡΟΜΟΥ	HIPPODROME GRANDSTAND
14	ΧΩΡΟΣ ΣΤΑΘΜΕΥΣΗΣ ΑΥΤΟΚΙΝΗΤΩΝ	PARKING AREA
15	ΜΟΝΑΔΑ ΒΙΟΛΟΓΙΚΟΥ ΚΑΘΑΡΙΣΜΟΥ	SEWAGE TREATMENT PLANT

Appendix F

Sub-contractors' List